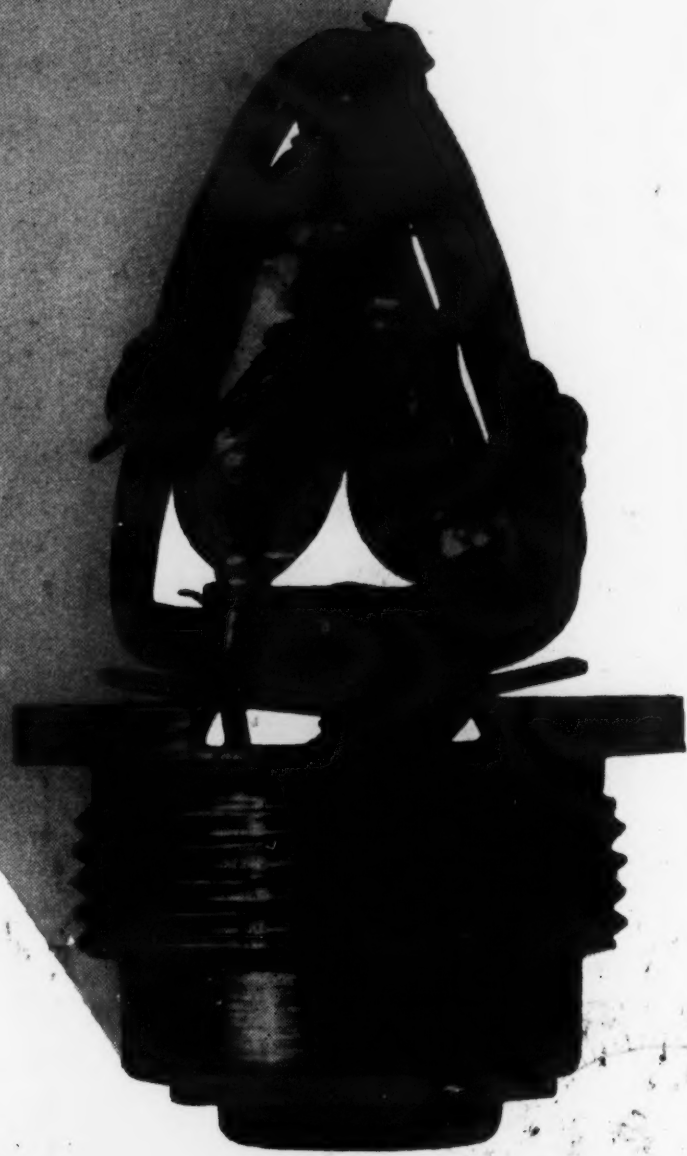


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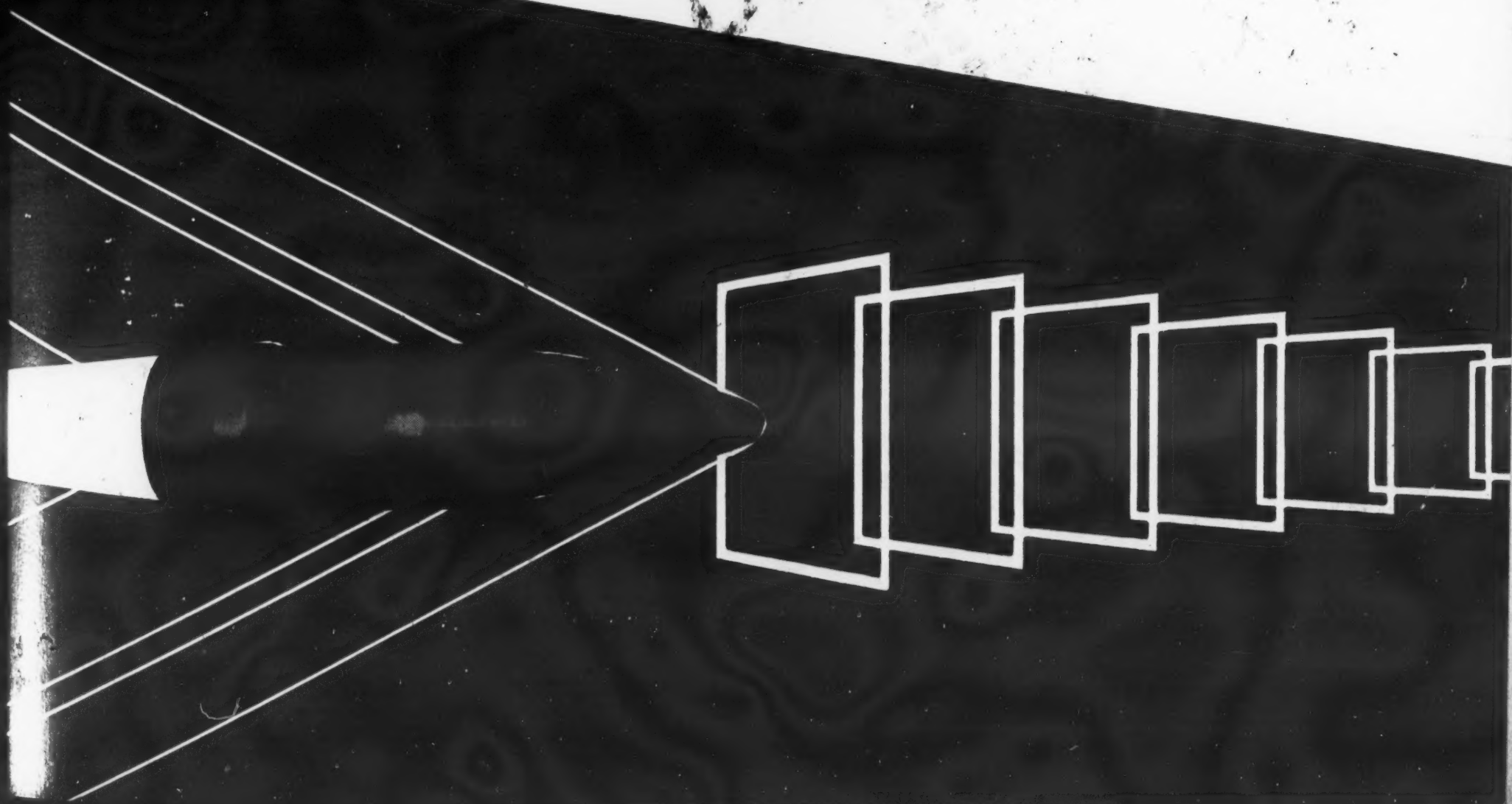
Communications—Electronics—Photography



SIGNAL



Flying through the air in the nose of a 20 millimeter projectile (below in actual size) a *transistorized radio transmitter* (left, greatly enlarged) signals data to antennae strung on wood frames along the range.



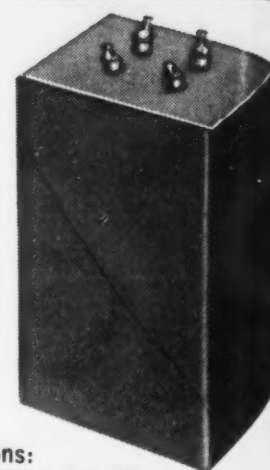
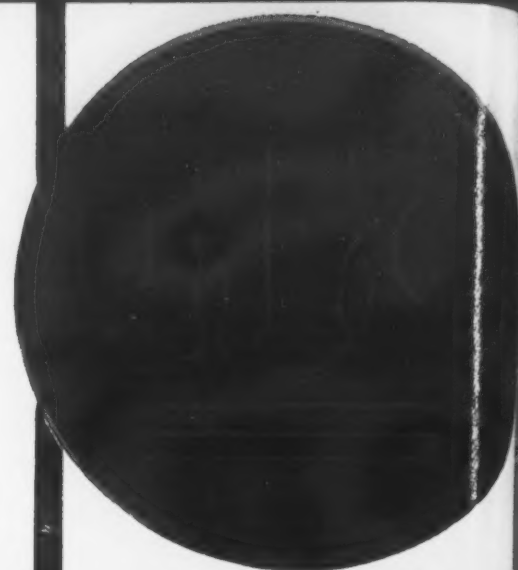
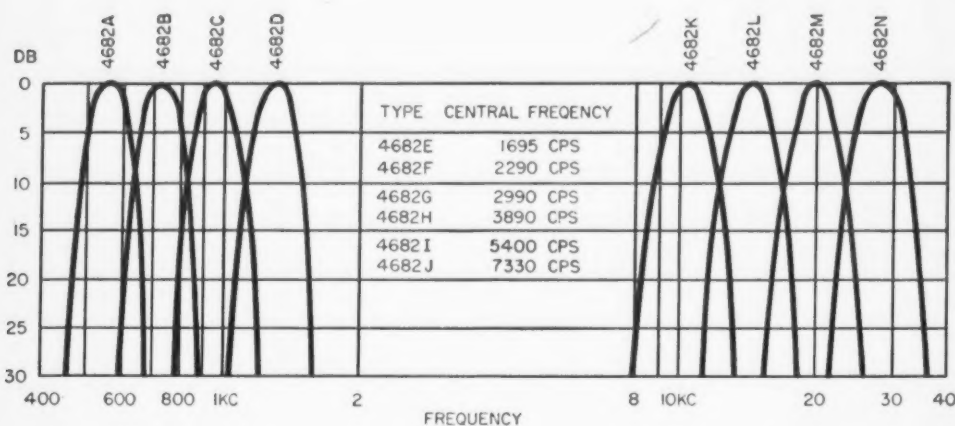
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FILTERS

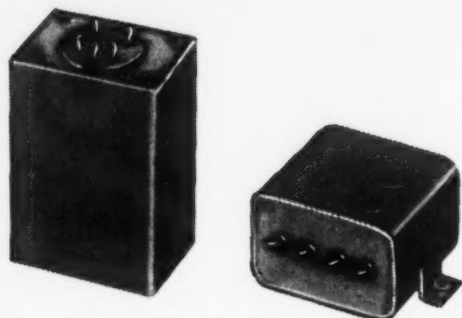
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TELETYPE FILTERS

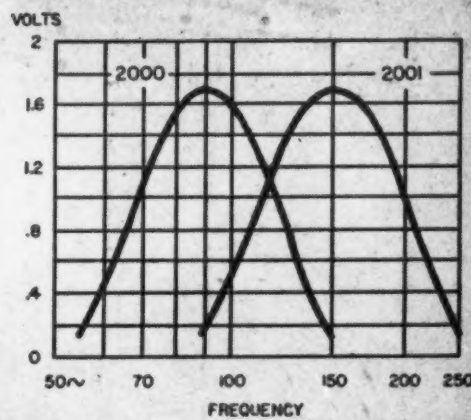
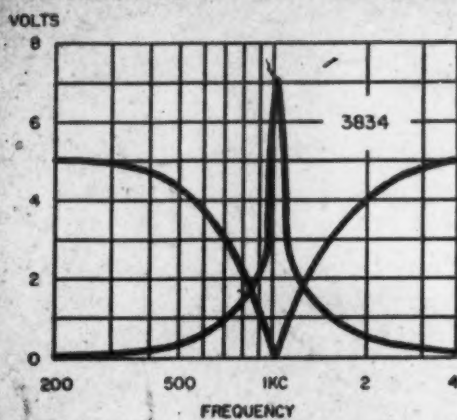
UTC manufactures a wide variety of band pass filters for multi-channel teletyping. Illustrated are a group of filters supplied for 400 cycle to 40 KC service. Miniaturized units have been made for many applications. For example a group of 4 cubic inch units which provide 50 channels between 4 KC and 100 KC.



Dimensions:
(4682A) 1 1/2 x 2 x 4"



Dimensions:
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(2000, 1) 1 1/4 x 1 3/4 x 1 5/8".



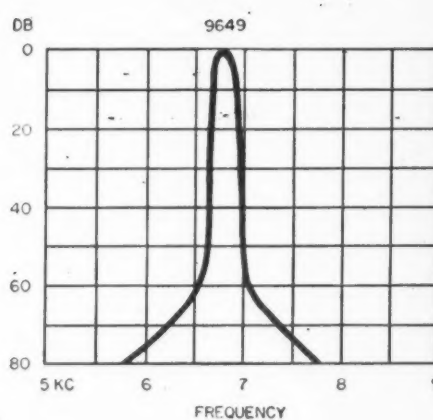
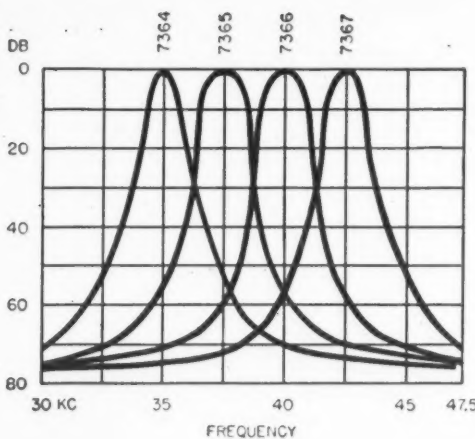
AIRCRAFT FILTERS

UTC has produced the bulk of filters used in aircraft equipment for a decade. The curve at the left is that of a miniaturized (1020) range filter providing high attenuation between voice and range frequencies.

Curves at the right are that of miniaturized 90 and 150 cycle filters for glide path systems.

CARRIER FILTERS

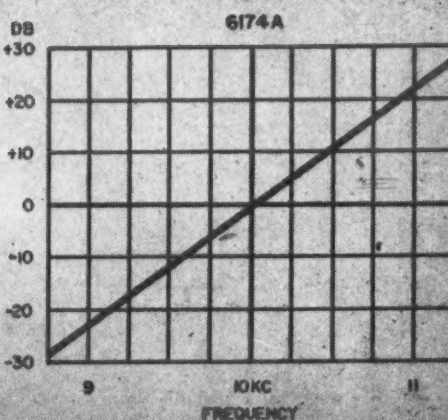
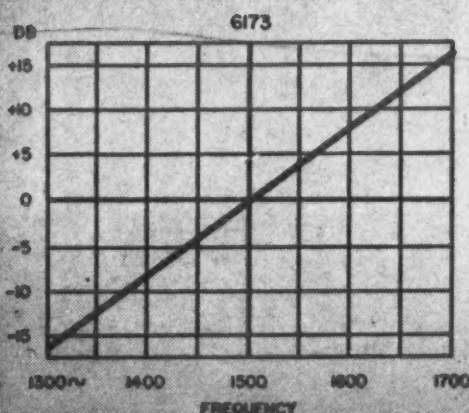
A wide variety of carrier filters are available for specific applications. This type of tone channel filter can be supplied in a varied range of band widths and attenuations. The curves shown are typical units.



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SIGNAL

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VOLUME 9

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NUMBER 2

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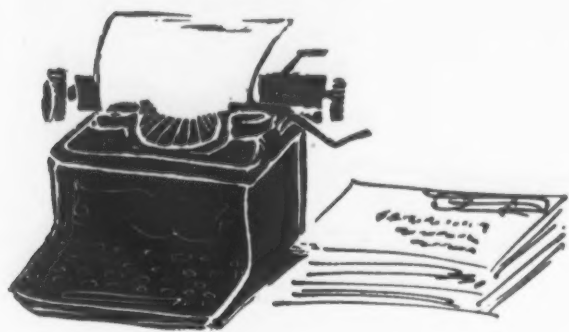
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Our Readers Write

Transistor Story

DEAR SIR:

I am particularly pleased with the Transistor article by Van Harlingen, Owens and Hall in the September-October issue.

I feel that this article fills a long-standing need for an honest summary of transistor progress and prospects, and is a welcome change from the "gee whiz" type of journalistic treatment the subject has heretofore received.

JUSTIN R. SYPHER, JR.
Washington, D. C.

Program for Civil Defense

The following letter contains a report of the Dayton-Wright Chapter's Civil Defense chairman. It is reprinted for the information and interest of other chapters, and to demonstrate how AFCA chapters can cooperate with community Civil Defense headquarters.

DEAR SIR:

This is to report a visit-conference of the writer with Colonel Jack Gault at his office—Civil Defense Building, Stillwater Area, Dayton.

After meeting Colonel Gault, general conversation ensued in which the writer, representing the Dayton Chapter, AFCA, expressed the desire of the



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Air Associates, Inc., Teterboro, New Jersey
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Librascope, Inc., Glendale, California
Maida Development Company, Hampton, Virginia
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The Plessey Company, Ltd., Ilford, Essex, England

(Complete list of AFCA Group Members appears on page 40.)

332 new individual members from September 1 to November 1



Chapter to be of assistance in achieving the Civil Defense objective for the city of Dayton.

Colonel Gault described briefly the broad aspects of the Civil Defense program. Of significance to AFCA was his account of the inadequacy of the present CD communications facilities to cope with the volume of simulated disaster information channeled into the control center at CD headquarters. This was demonstrated during the recent alert.

Wardens within the seven zones that constitute the city of Dayton were unable, due to a deficiency of assigned frequency bands, to dispatch and exchange information rapidly. Measures have been taken to correct this situation in the form of request for additional communications channel-frequency allocation.

The factor of time, as it concerns the exchange-transfer-dispatch of information between the various zones and CD headquarters and the follow-on transfer of the information to the control room for recognition, programming and assignment, still remains a major problem with respect to present methods of communication in use at CD headquarters.

Colonel Gault expressed the belief that the greatest assistance to the CD program that AFCA could offer would be to activate a project to explore-investigate-report-compile-analyze-evaluate current data on industry-military which would reflect the latest advancement-methods-systems for the visual presentation and dispatch of intelligence.

ARTHUR S. LORD
Dayton Chapter, AFCA

COVER STORY

Tiny Transistorized

Radio Transmitter

Aids Defense Research

A miniaturized radio transmitter fitted into the nose of a 20 millimeter projectile is one of the latest electronic devices developed by the Naval Ordnance Laboratory, White Oak, Maryland, for the testing of ordnance equipment.

This spin sonde is designed to withstand acceleration shocks of 30,000 g and above, remarkable for as delicate an instrument as a transmitter. Miniaturized by the use of transistors, it is effective as a telemetering device for the study of projectiles using fins as a means of rotation in flight. Data transmitted by the radio makes it possible to determine the spin rate or change

in spin rate, a factor which influences flight behavior.

The signal from the transmitter, which varies in amplitude with the orientation of the transmitter in relation to the antenna, is sent from the nose of the projectile as the projectile is shot through frames hung along the firing range. The antenna which receives the signals is strung on the frames.

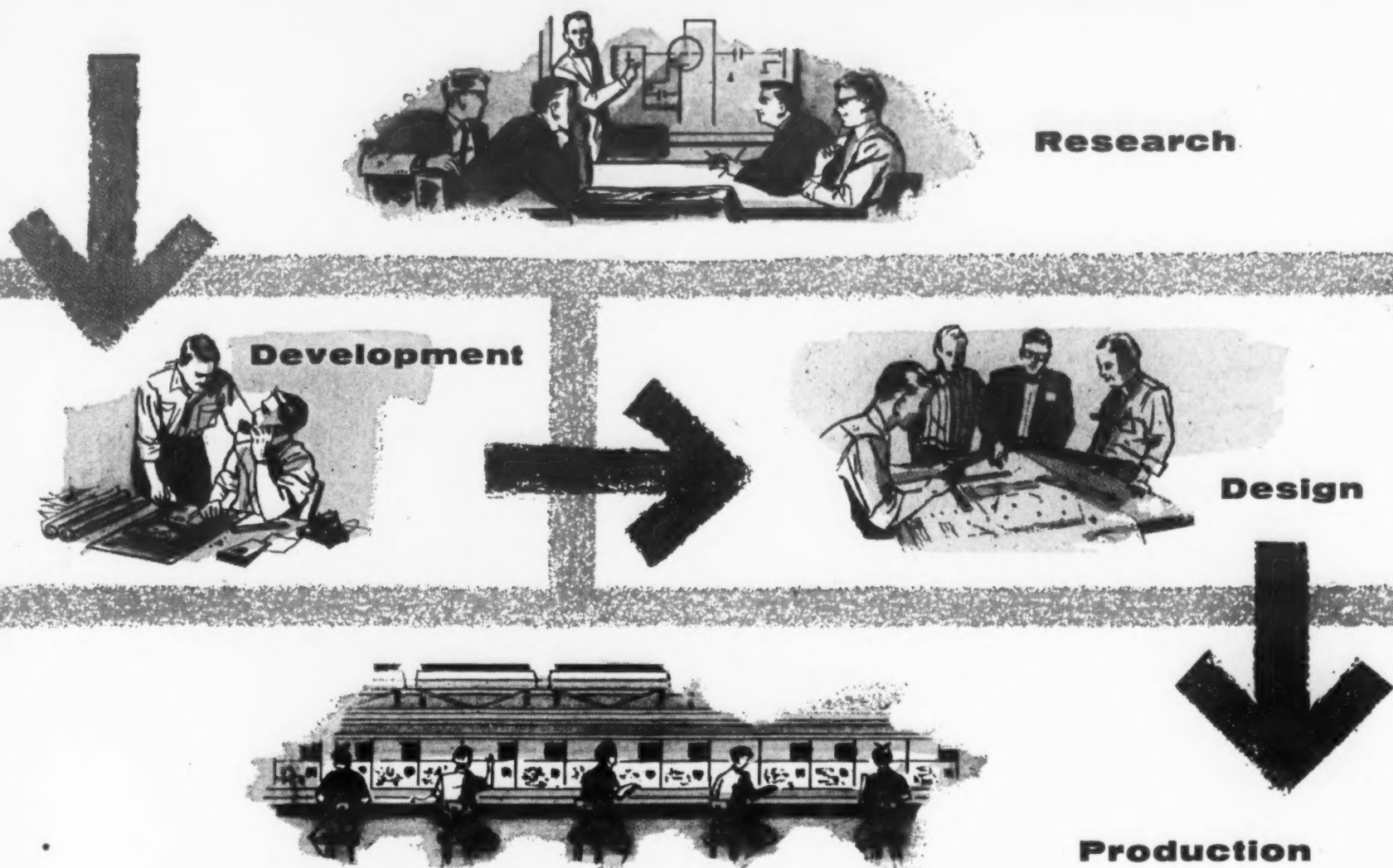
(See cover for illustration of frames, with the projectile including the transmitter nose in actual size, and an enlarged view of the transistor-type radio frequency oscillator before it is encased in super-strength plastic to form the nose.)

An early greeting, but our last chance before the holidays

to wish **A MERRY CHRISTMAS**

to all our members and readers.

—from the staff of AFCA and SIGNAL



AN INTEGRATED ELECTRONICS OPERATION

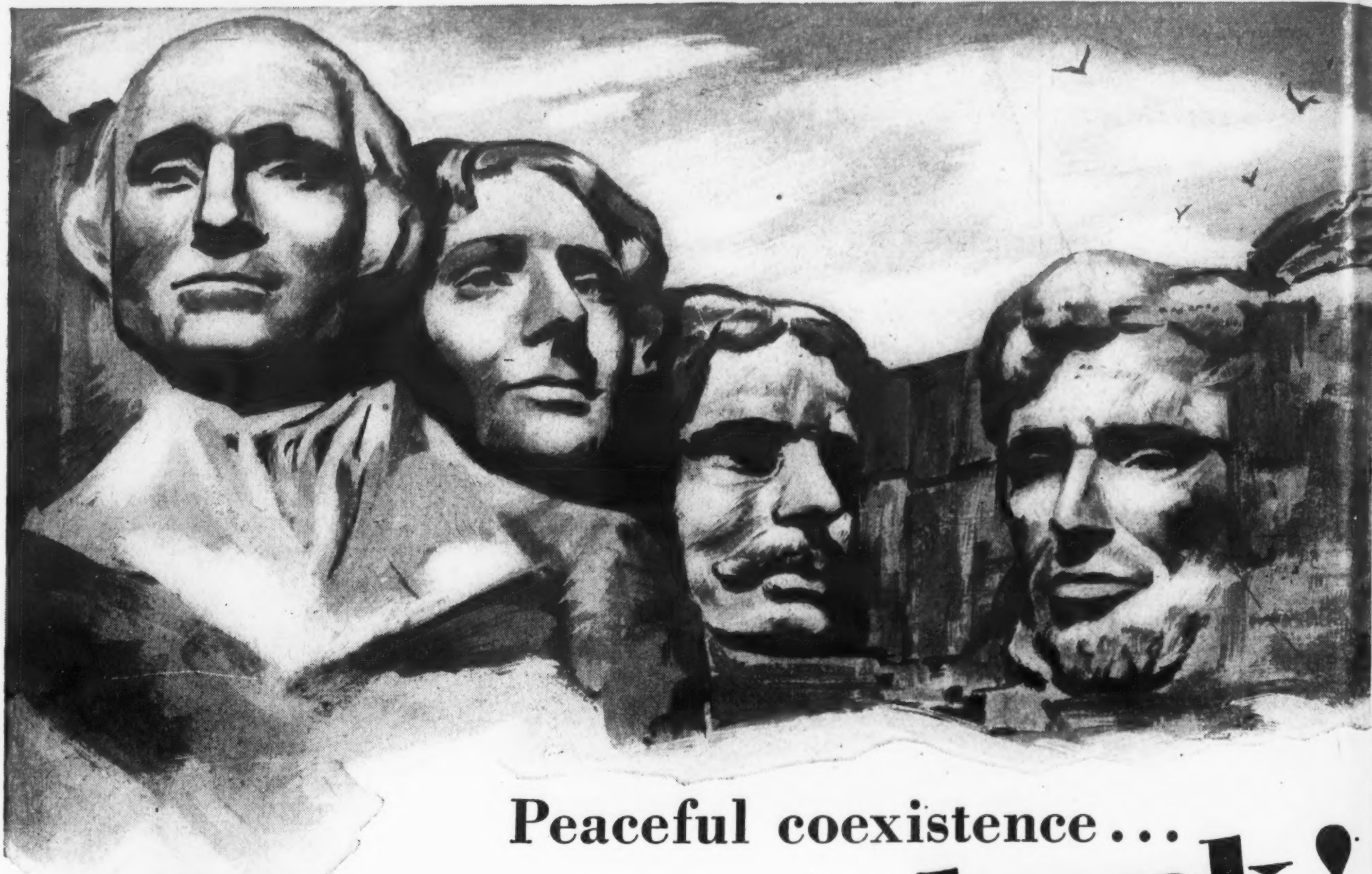
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How long communism can live, no one knows. Freedom will never die. Its leaders will long outlive communism's "unholy three." Tyranny always causes its own destruction.

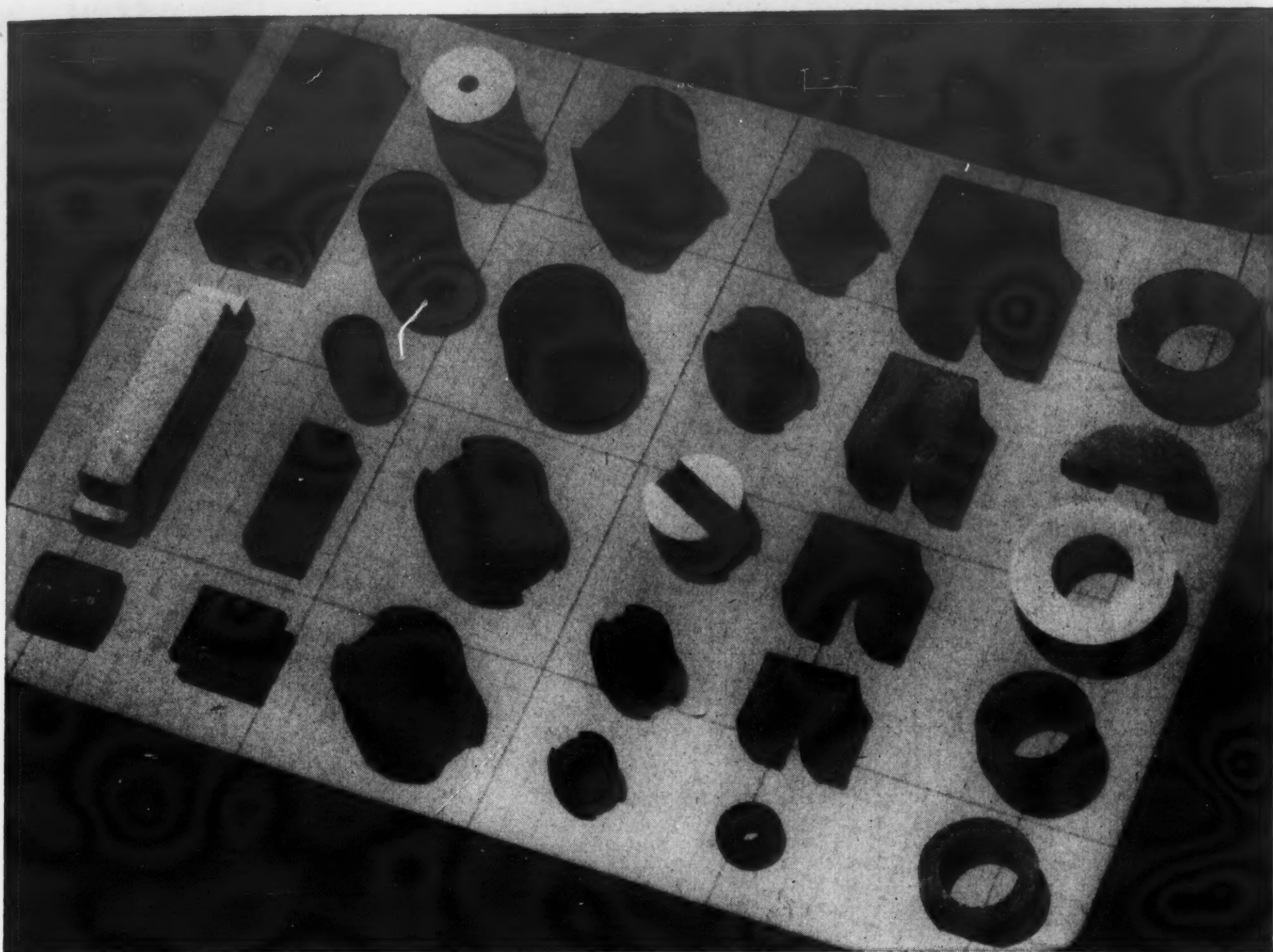
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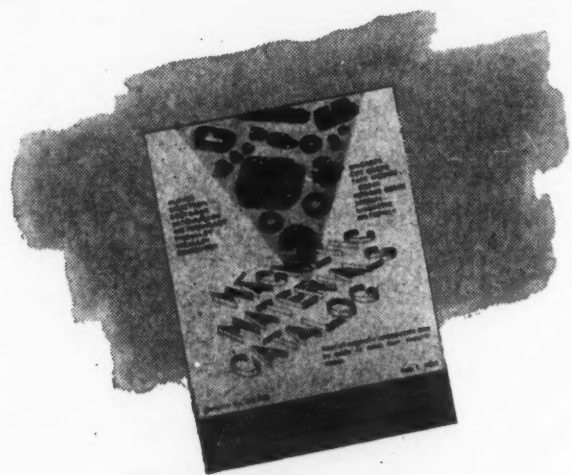
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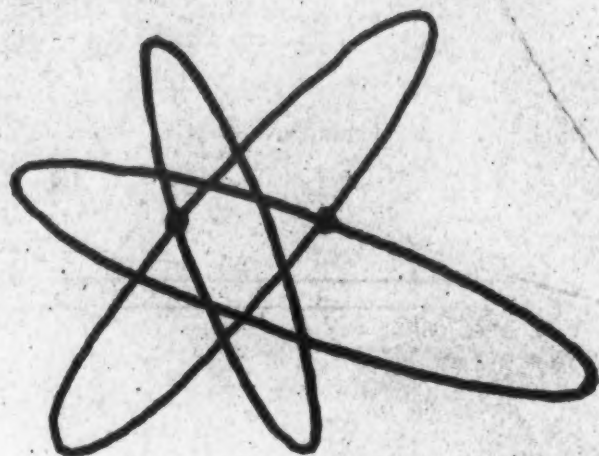
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by Lt. Commander F. J. Malloy, USCG

**Electronic Engineering Division
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Standard Loran System

LORAN IS AN ELECTRONIC NAVIGATIONAL system for determining positions by means of precisely timed radio signals transmitted on one of two operating frequencies, 1850 or 1950 kcs, in the band 1800-2000 kcs. The term is derived from the initial letters of the words LONG RANGE Navigation and consequently implies that the distances involved are greater than those associated with the familiar radio direction finding methods.

Ordinarily, over sea water, ranges of from 700 to 800 nautical miles may be expected during the daytime and up to 1,400 nautical miles at night. Average accuracy of line of position at the above distance is 1.5 nautical miles for daytime ground wave and 5 nautical miles for night skywave service.

On the ship or aircraft a Loran receiver is used to determine the difference in times of arrival between the related pulses from a "master" and from a "slave" station to within

a microsecond. This measurement determines the line of position as indicated on specially prepared charts (or tables). A similar measurement made on a second pair of Loran ground stations provides a second line of position. The intersection of two or more lines of position determines the location of the ship or plane.

The principle of the system's operation is based on the difference in travel time (measured to millionths of a second) to the point of observation of radio signals from two transmitting stations spaced several hundred miles apart. Let us assume that pulse signals are transmitted at exactly the same instant from the two transmitting stations. It is evident that, along the perpendicular bisector of the baseline connecting the two stations, the two pulse signals will arrive at exactly the same time, since any point along this bisector is equally distant from the two transmitters. For observation points on either side of the bisector, the signal from the nearer station arrives ahead of the signal from the other station, and the

loci for observation points of given time differences are represented by hyperbolas with the transmitting stations at the two foci. The hyperbolas on the side of the bisector toward transmitting station, let us say "A", correspond to pulses from "A" arriving first. On the other side of the bisector is a similar set of hyperbolas corresponding to pulses from transmitting station "B" arriving first.

Since the pulses from the two transmitting stations are essentially identical in shape, it is not possible to tell whether the pulse which arrives first originated at Station "A" or Station "B". This results in an ambiguity as to which of two hyperbolas, one on each side of the bisector, is the true space line of position. To overcome this ambiguity and at the same time simplify the measurement method, the pulses from the two transmitting stations are not transmitted simultaneously, but those from one station are delayed a precise amount of time in order that the pulses from that station will always arrive last. The amount of this delay needs to be

at least equal to slightly more than the travel time of the radio signal between the two transmitting stations. Actually the delay used is much more than that. However, as long as it is always a definite amount, proper allowances can always be made.

The transmitted signals are not random pulses, first from one transmitter and then the other, but a series of carefully timed pulses which are precisely interspaced from each position. The time interval between each station's pulses is constant for a given pair of stations but differs for various pairs as a means of identification and to avoid interference of other Loran signals. The recurrence periods vary from about 30,000 microseconds to 50,000 microseconds.

At one station of a pair the pulse intervals are derived directly from circuits within the timing equipment of that station without regard to the timing relation of these pulses with the pulses from the remote station. This station is called a "master" station. At the other station of a pair the same pulse intervals are derived within its timing equipment but, additionally, the phase of the pulses is controlled to have a very accurate time relationship with the phase of the pulses from the master station. This station is called a "slave" station.

Loran stations are arranged so that signals from two or more pairs of stations may be received in strategic areas, and thus a Loran fix can be obtained by crossing two or more lines of position.

In order to economize on station installations one station may be made common to two pairs. As illustrated in Figure 1, A_1 and A_2 is a common or *double-pulsed* station (master), and B_1 and B_2 are *single-pulsed* stations (slaves). Double-pulsed stations send out pulses at two distinct repetition rates of pulses; one rate is paired with the pulses of one adjacent station, and the second rate is paired with the pulses of the other adjacent station.

Loran Transmitting Station Equipment Described

The two basic units of a Loran transmitting station are the radio transmitter and the timer. The transmitter generates pulses of r-f energy which are fed to the antenna system. In order to permit double-pulsing, each transmitter incorporates two "exciter" groups. An exciter contains (1) a frequency generating subassembly which (from an external 100-kc control signal or a self-contained crystal) develops a radio-frequency drive and (2) a pulse

forming section which (from external timer trigger pulses) times and shapes the transmitter output.

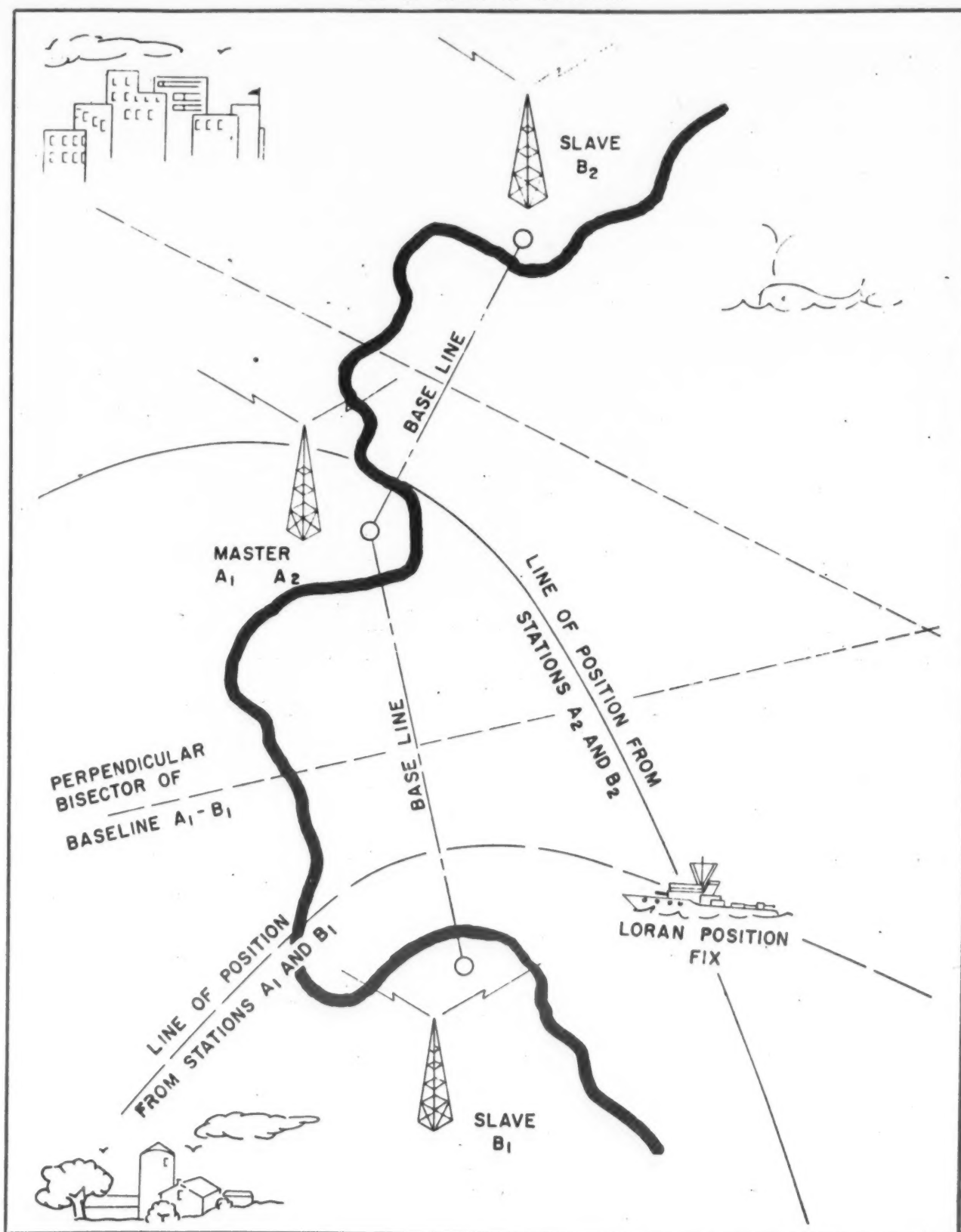
It is evident that, in addition to the radio transmitter, power supply, antennas, and associated accessory equipment usually found in a radio transmitting station, a Loran station must also include equipment for timing the pulses accurately. The timing equipment must: (1) establish the pulse interval, or pulse recurrence rate, at any one of a number of standard rates; (2) establish the delay between master and slave to any specified value; (3) permit constant monitoring of the pulse transmissions for correct timing, delay, etc.; and (4) provide means of maintaining synchronism between stations by making minor corrections at one of the two stations. The last function, in practice, is performed only at a slave station although, technically, it could be done equally

well at either.

Because the functions of the timing equipment are basically similar at a master and a slave station, identical timers are used. In other words, the same type of timer is used at each station, the small differences in operational requirements being met by appropriate adjustment.

The timing intervals mentioned above are measured in microseconds (millionths of a second) by means of several series of timing pulses ("markers") spaced at various intervals ranging from one microsecond to 1,000 microseconds. The infinitesimal passage of time represented between these markers, or even the greater pulse interval (30,000 to 50,000 microseconds) between transmissions of the Loran signals, is almost inconceivable compared to the more familiar time units of seconds and minutes. Yet this timing equipment must measure and portray these

Figure One. A_1 — A_2 is a common or double-pulsed station and B_1 and B_2 are single-pulsed stations. The repetition rates from the double-pulsed station are distinct and pulses are sent out at different intervals.



small bits of time so accurately and consistently that, if added up for several years, the sum would not differ by more than one second from the actual elapsed time. This precision is essential in the Loran system, in which microseconds of time difference measured at the ship or plane become miles of difference in position when plotted on the chart by the navigator.

Such precise timing can be accomplished only by specially designated electronic circuits which will retain their precision in spite of varying atmospheric and other conditions. In Loran timing equipment the accuracy is maintained within a few parts in a billion. However, even this slight deviation could build up an error in the Loran reading unless compensated. Therefore, it is necessary to correct constantly (at the slave station) for the slight difference which accumulates between the errors of two timers working together as slave and master.

Timer Functions Coordinated

The primary purpose of a Loran timer is to control (trigger) the pulses generated by the transmitter, spacing them with absolute uniformity and with precisely timed reference to the pulses received from a second transmitter located several hundred miles away. Several functions, performed by the various units of the timer, are co-ordinated to accomplish this purpose.

Principally, the timer:

- a. Generates the excitation (trigger) pulse which actuates the local transmitter periodically.
- b. Generates a very accurate

timing signal for the control of the transmitter trigger pulse.

c. Converts the timing signal of *b*, above, into large, small, and intermediate time units which can be used for measuring the time relationship of the local and distant Loran pulses.

d. Receives the pulse signal generated by both the local transmitter and the other ("remote") transmitter.

e. Provides a visual indication (on cathode-ray oscilloscopes) of the remote pulse, the local pulse, and the time units (marker pulses) so that the time interval between the two pulses can be determined and maintained. (Maintaining the proper time difference, or "delay", as seen on the scopes, is called "synchronizing." This is the timer operator's principal duty.)

f. Provides manual facilities for establishing, and later correcting, the time interval between remote and local pulses and also for correcting the basic timing signal (of *b*) which controls that time interval.

g. Provides automatic facilities for correcting and maintaining the basic timing signal which controls the time interval of *f*.

The following are the major units which comprise a functional Loran station:

- a. Two radio transmitters (one operating, one spare).
- b. (1) Double-pulsed operation: four Loran timers (two operating, two spares).
- (2) Single-pulsed operation: two Loran timers (one operating, one spare).

c. One Loran Switching Group, Type AN/FPA-2.

d. One terminal box (for transmitter).

e. One transmitting antenna.

f. One receiving antenna.

g. Suitable power equipment.

h. Suitable test equipment.

i. Miscellaneous (antenna coupling units, ground system wire, ground strips, coaxial cables, spares, etc.).

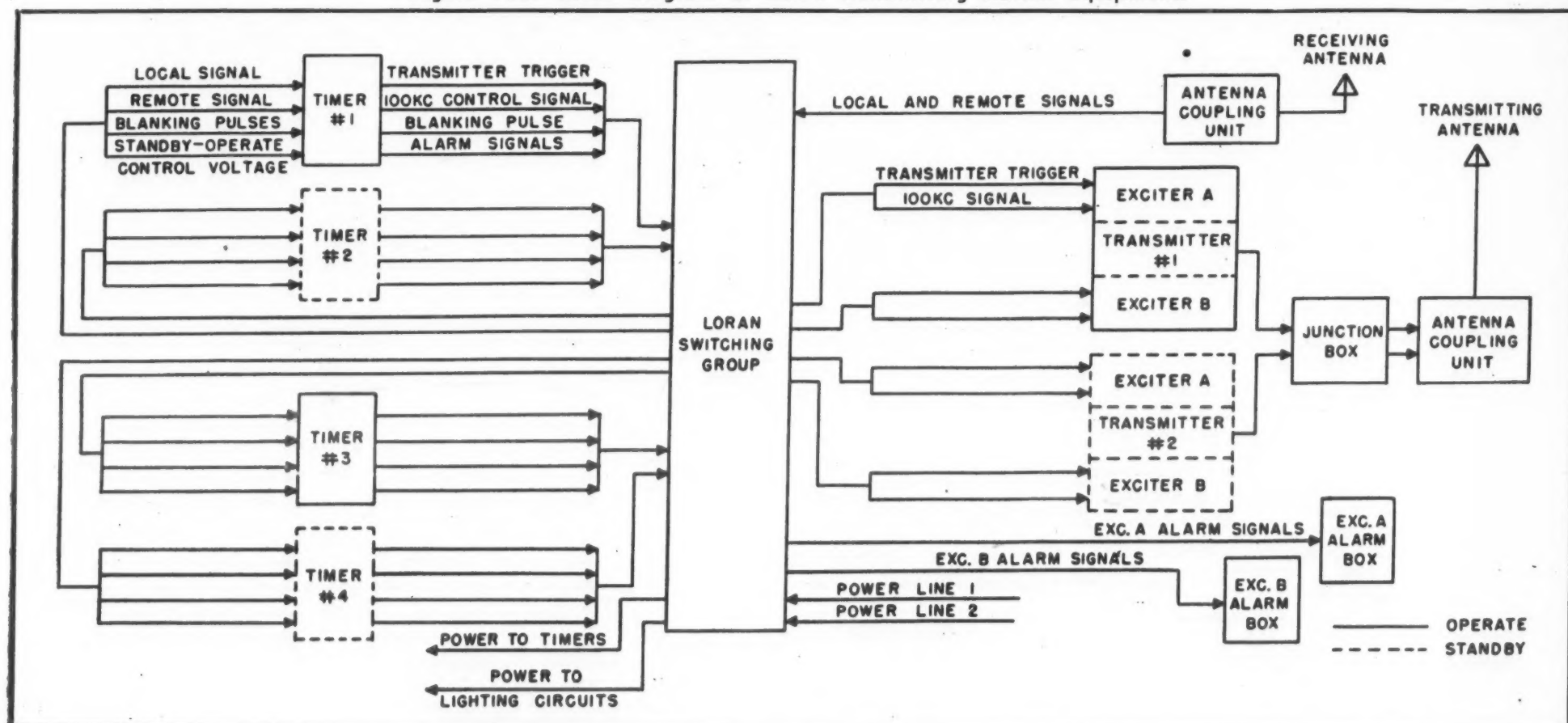
A block diagram utilizing the equipment specified is shown in Figure 2.

The Loran switching group is employed at a Loran station to perform three distinct functions: selective switching, electronic switching (remote and local signal separation and amplitude equalization), and power isolation and distribution.

Because of the duplication of timing and transmitting equipment at a Loran station as shown in Figure 2, it is clear that switching equipment must be provided to interconnect these units. This is the selective switching function of the switching group.

As indicated in Figure 2, the switching group provides for: selectively connecting the transmitter trigger pulse and the 100-kc control signal outputs of any of the four timers (two operating, two standby) to any of the four exciters of the two transmitters (one operating, one standby); selectively connecting the local and remote Loran signals from the receiving antenna to any of the four timers; connecting the blanking pulses of the two operating timers to the switching group and all timer receivers; connecting the alarm signal outputs of the two operating timers

Figure Two. Block diagram of Loran transmitting station equipment.



to the alarm indicators; and connecting the STANDBY-OPERATE control voltages to the two operating timers.

Pulses from the remote and local station must be fed to the timer for purposes of synchronization. These signals are received on a common antenna. Because the local signal will be vastly stronger than the remote signal, means must therefore be provided to reduce the amplitude of the local signal. The local and remote received signals are fed from the antenna through a resistive matching network to the electronic switch units of the switching group. Here they are separated into two distinct channels and the amplitude of the local signal reduced. From the electronic switch units signals are passed on to the timer receiver where still further reduction in local signal amplitude occurs so that the local and remote signals are of identical amplitude at the output of the timer receiver.

Thus the second function of the switching group is to separate the local and remote signal and reduce the amplitude of the local signal.

World-Wide System

For double-pulsed operation a Loran station will normally include four timers (two operating, two spares) and two transmitters (one operating, one spare). The two operating timers supply trigger pulses at two different repetition rates to the two exciters of the operating transmitter. For single-pulsed operation the station will normally include two timers (one operating, one spare) and two transmitters (one operating, one spare), the single operating timer supplying trigger pulses at one repetition rate to one of the exciters of the operating transmitter.

As illustrated in Figure 2, in addition to the timers and transmitters, a Loran station must be provided with switching equipment, a source of power, antennas, coupling units, test equipment, etc.

The world-wide deployment of Standard Loran Transmitting Stations is shown in Figure 3. The country operating each individual station is indicated on the chart. These countries are: United States, Canada, Denmark, Iceland, and Great Britain. While Loran transmitting stations are operated by various countries, the Loran transmitting station technical equipment is essentially the same in all stations.

The Loran system as presently conceived and operated throughout the world is doing its part as a vital aid to air and marine navigation.

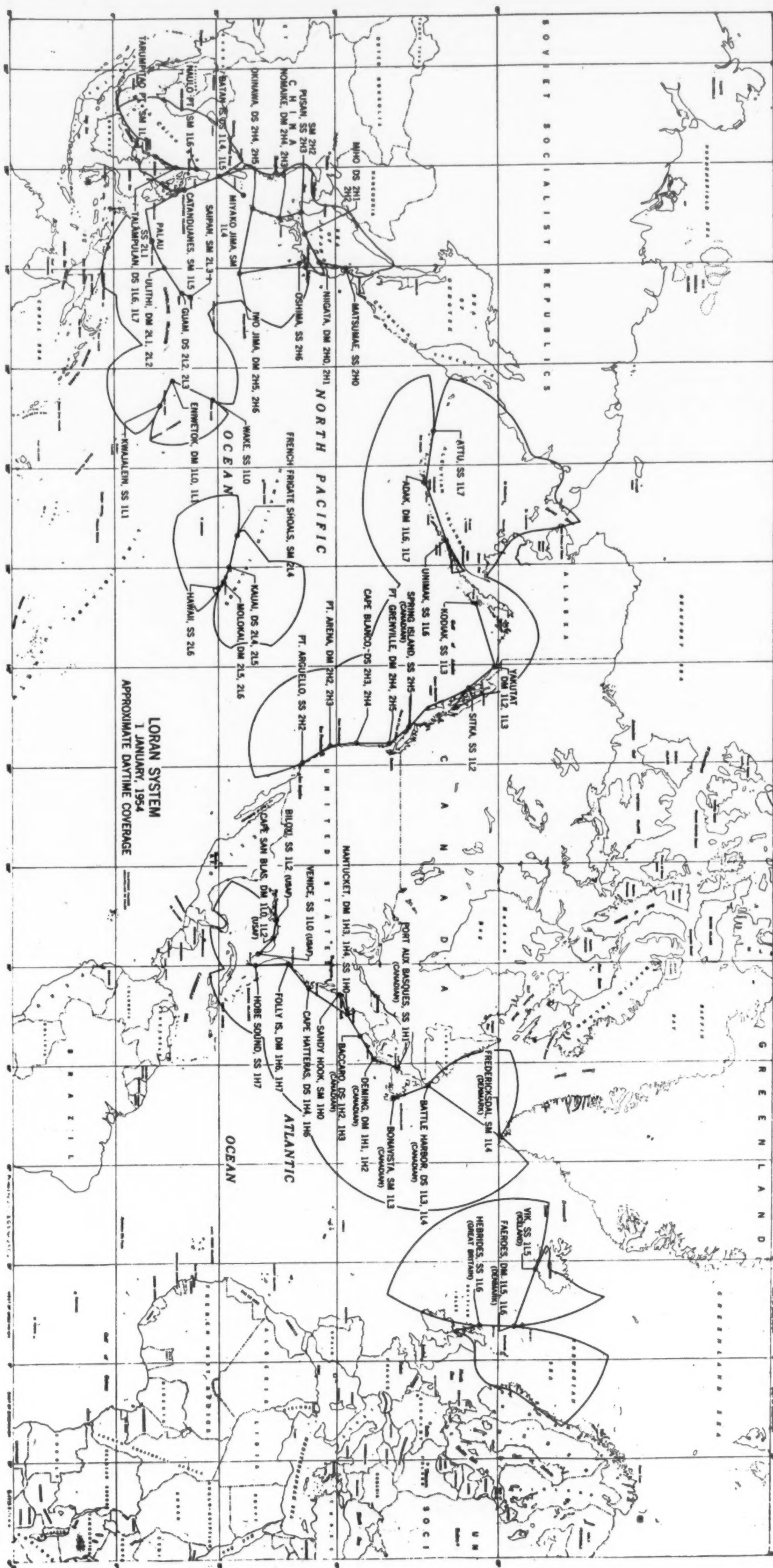


Figure Three. The world-wide operation of standard Loran transmitting stations, shown above, is technically the same in all countries and essentially the same equipment is used in all the stations.

science vs. security

Science objects to:

1. Apparent lack of trust on the part of military planners, resulting in both the scientists and the planners working in a vacuum.
2. Assignment of unimaginative and unenlightened service personnel to positions which control the cooperative security apparatus between the two groups.
3. Security clearance procedures being slow and cumbersome.
4. The many limitations on the reproduction and distribution of classified materials.
5. The additional administrative and inspection burdens which interrupt normal scientific processes and result in supposedly needless loss of time and delay.

Security objects to:

1. Lack of comprehension of the need for security and/or the ways which it should be used.
2. Science setting itself up as an authority on world military strategy and tactics.
3. Classified conversations in insecure places.
4. Too much material of classifiable nature being turned out with little or no accounting.
5. The assignment of information security responsibility to unqualified persons who may be well versed in plant security but lack the scientific background necessary to handle the former.
6. The complaints of science about slow clearance procedures and yet, at the same time, failure to use the more speedy techniques available.

by Colonel Ivan D. Yeaton, USA (Ret)

**Chief, Industrial Security Division
Christian L. Engleman & Associates
Washington, D. C.**

Just as science is here to stay, so is security. The two must learn to live together in peace and harmony. With intelligent handling and cooperation, there is no reason for mistrust of the future.

Effective *security* does mean some delay to *science*, but it must be remembered we are engaged in an all-out economic and military race with Totalitarianism. Time is a very important factor in this race. If we are to believe that science and industry grow best in the garden of a free democratic economy in peace time, then time is of lesser importance to us than to our competitors under totalitarian economy.

We proved conclusively in World War II that our economy is capable of almost unlimited speed-up under a national emergency. Our opponents likewise proved at the same time that their production slows down. They reach their peak of production during an era of peace. Time, therefore, also appears to favor us in emergencies.

How are our competitors attempting to make up for this time lag? In the one easiest, quickest, and cheapest way; by profiting by our mistakes, achievements, and the end results of our long and expensive experiments. A little serious thought will quickly indicate that a little less haste accompanied by a little more *security* will pay great dividends toward widening the time breach between us. Why hand our potential enemies billions of dollars of scientific effort on a silver platter. Time is not necessarily worth that!

The Department of Defense is well aware of the problem and is making every effort to simplify administrative and security procedures consistent with the national security and scientific advancement of the country. Every effort is being made to narrow the so-called breach between the two vital factors of our national economy, Science and the Military.

A clear understanding of the efforts being made by the Department of Defense to solve these problems plus an intelligent interpretation of the regulations they issue will show that many supposed barriers do not exist or have been imposed through careless and improper practices.

Looking at the problem objectively, it appears that a little less rigidity and a little more tolerance and understanding on both sides will help a lot. Military men have been guilty, at times, of causing undue hardships on *science* by not thoroughly knowing and understanding their jobs to the point where they could intelligently interpret the regulations and helpfully advise *science*. . . . And many scientists have cried about *security* before they were hurt because they wouldn't take the time to examine and understand the issues at stake.

The solution to the vacuum problem is certainly more high level discussions and seminars between responsible military and scientific leaders. It is true that military men have at times foolishly withheld plans from the scientists. The word "foolishly" is purposely used because we have learned the hard way that a little knowledge plus an educated guess can come devastatingly close to the actual truth. Experience has taught us that, at times, it is far safer to trust men in important categories and swear them to secrecy than tell them too little and let them guess without restrictions.

The scientists could learn a lesson from the military by sticking to their own profession. While the military have been taught to carefully explain WHAT they want, they have been equally carefully taught not to go into details as to HOW to do it unless it is a matter of teamwork. On the

other hand, it appears to be a failing of the scientists to want to set themselves up as experts on world strategy as well as tactics. Military's so-called "resistance to new ideas" is a charge that would be hard to prove—many times it is purely a matter of money or security and in no sense resistance to new ideas.

It has been said the greatest indictment against *science* is that many of their members accept highly important classified research positions and then ignore the fact that responsibility for *security* goes with the job. There are a great many security decisions that can be made only by *science* itself because of the administrative procedures and scientific knowledge involved. These responsible decisions cannot be delegated to administrative assistants and under no circumstances should they be thrust upon plant security personnel who have little or no scientific background. Science MUST accept that responsibility if they want the complete trust and confidence of not only the military but the people of these United States.

In conclusion, it might be well if the military made more of an effort to better understand the position, problems, and requirements of *science* as it relates to the *security* problem. It is the military's responsibility to help *science* intelligently interpret the security regulations and not take a fixed inflexible attitude toward them. Good *security* is compatible with expediency in scientific work when the overall administration is intelligent, efficient and respected. Under these conditions, *security* is not a hindrance but instead is effective and our classified material is secure from compromise.

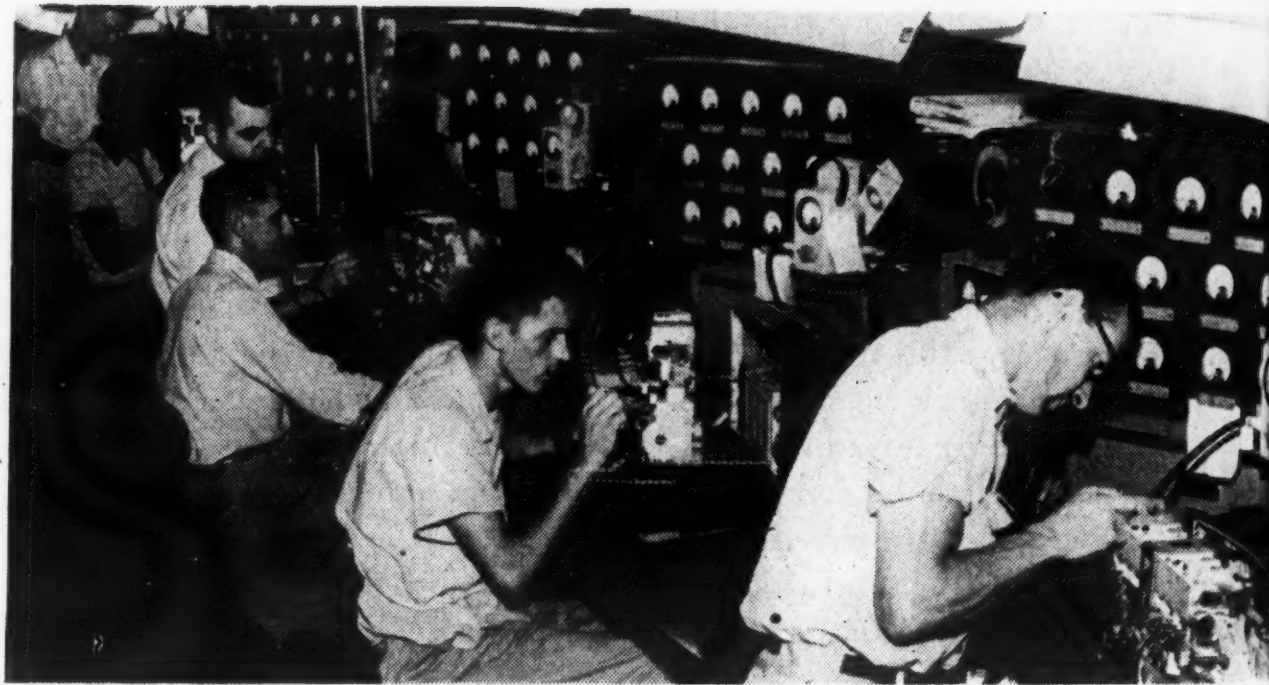
Radio Condenser Company

by **R. E. Cramer, Jr.**
Vice President
and
M. V. Weiss
Chief Engineer

THE MANUFACTURERS OF ELECTRO-MECHANICAL end-products for consumer use, both commercially and by the armed forces, are placing greater dependence and reliance upon the producers of component parts. The wide and increasing diversity of the electro-mechanical product line coupled with the intricate involvement of each component part, has caused the end-product producer to recognize the advantages of procuring many components from firms that have become specialists in certain specific fields of endeavor.

The urgent need for specializing in a dynamic industry such as the electro-mechanical was recognized by S. S. Cramer and R. E. Cramer as far back as 1921. With a limited amount of capital at their disposal, but with a wealth of technical "know how" and tireless energy and tenacity, they succeeded in building the Radio Condenser Company from a small producer of variable condensers to the largest manufacturer in this field and the producers of related products such as radio and TV tuners and special apparatus designed to meet the specifications of the armed forces.

The history and growth of Radio Condenser Company is closely related to the vast strides made in the field of military communications during the last two decades. In the early thirties, with an already established



Engineers at Radio Condenser are shown on the assembly line of the ARC-34 at the frequency test alignment stage.

background as a quality supplier of variable capacitors to the radio industry, it became apparent that a need existed for specialized "know how" to design and develop special capacitors and tuning devices for military and instrument application. This apparent need was well founded in fact as subsequent events have proved.

Recognizing the specialized and highly technical requirements of military communications equipment, the Radio Condenser Company formed a small group directed by engineering personnel to pioneer in this field. From this modest beginning has

grown the Special Apparatus Division of Radio Condenser Company, devoted exclusively to the design and manufacture of specialty tuning devices, precision variable capacitors and associated equipment for military and special commercial applications. The basic concept of this operation has been to provide the best in specialized engineering and manufacturing service.

One of Radio Condenser Company's contributions in this field was the development of suitable tuning devices for military equipments many years prior to World War II. This development included special, variable

33 years of service in the communications field give this company a right to the title of "expert" in the tuner industry.

TUNERS ARE OUR BUSINESS

capacitors running the design range from large units for Navy shipborne service right on through to units designed to work in small airborne equipments. In this respect, the Radio Condenser Company worked directly with the Signal Corps Engineering Laboratories, as well as with manufacturers, in the initial stages of development. The natural result of this cooperative effort was the design of units fully capable of meeting the particular service requirements, but equally as important, units that could be mass produced—as was proven in World War II when productivity was most urgent.

In all their engineering design considerations, the ability to reproduce prototypes in volume production is taken into consideration since the basic philosophy of Radio Condenser has been quality components in mass production. Units designed and produced in quantities of a few hundred prior to World War II suddenly became mass production items of five figure quantities. Such important items were the multi-section tuning capacitors for the BC-312 and BC-224 equipments.

The foresight and actual experience gained in design and production of this specialized type of component prior to World War II paid off when all facilities and resources were converted to war production. Not only was Radio Condenser able to produce

the special devices of its own design, but also to quickly set up and meet quantity demands for variable capacitors of types designed and formerly produced by other manufacturers. The highly precise capacitor and drive assembly of the SCR-211 frequency meters is one of the many outstanding examples in this category, whereby, with slight modifications to better suit mass manufacturing with a higher degree of uniformity, close to 100,000 of these

units were produced in the early period of the war.

Many notable contributions to the art of multi-section, variable capacitor designs for use in all types of electronic applications have been made over the years. Some of the more basic items include the development of means to apply many types and grades of dielectric insulation to multi-section variable capacitors in such a way that manufacturing losses of fragile dielectric materials are

The officers of Radio Condenser Company are: (standing) W. W. Paul, executive vice president; R. E. Cramer, Jr., vice president; (seated) R. E. Cramer, president, and S. S. Cramer, chairman of the board.



negligible and at the same time the capacitors provide the utmost in reliability under the most adverse conditions encountered in military gear. Simple but effective means for thermal compensation, where necessary, were developed and put into production.

One of the most vital contributions in basic design principle was the adaptation and practical use of non-metallic materials for rotor shafts in multi-section variable capacitors. This involved the use of low loss ceramics in rod form, which are naturally fragile and presented a real challenge from a design standpoint to provide

"Talkie" produced in great volume during the war, and the subsequent evolution to the much-publicized PRC-8-9-10 pack set series. These are but a few of the many specific instances that can be cited. This type of specialized service to industry is continuing at Radio Condenser but on a greatly expanded scope, including wired and actual circuit tested components and electronic assemblies for varied applications.

Radio Condenser Company is ideally located, with headquarters at Camden, New Jersey. This location is close to many of the leading Government and private industry electronic

riveting, swaging, and final assembly.

Special methods of electroplating have been developed to control critical thicknesses of deposit and uniformity of coverage in complex sub-assemblies whose electrical characteristics and performance can be greatly influenced by this operation. Compliance with Joint Army and Navy specifications regarding protective quality of finishes is carefully checked at all times.

In addition to the excellent facilities for fabrication, assembly and final test of its products, Radio Condenser maintains extensive factory engineering and inspection divisions to see that highest standards of quality are maintained at all times.

Radio Condenser Company has within its Camden plant, in addition to the Special Apparatus Division briefly described above, a Commercial Division which is devoted to the manufacture of electro-mechanical tuning devices for the radio-television industry. It has pioneered in the development and mass production of such products as television tuners (both VHF and UHF), auto radio tuners and allied products, all completely wired, fully tested, ready for application.

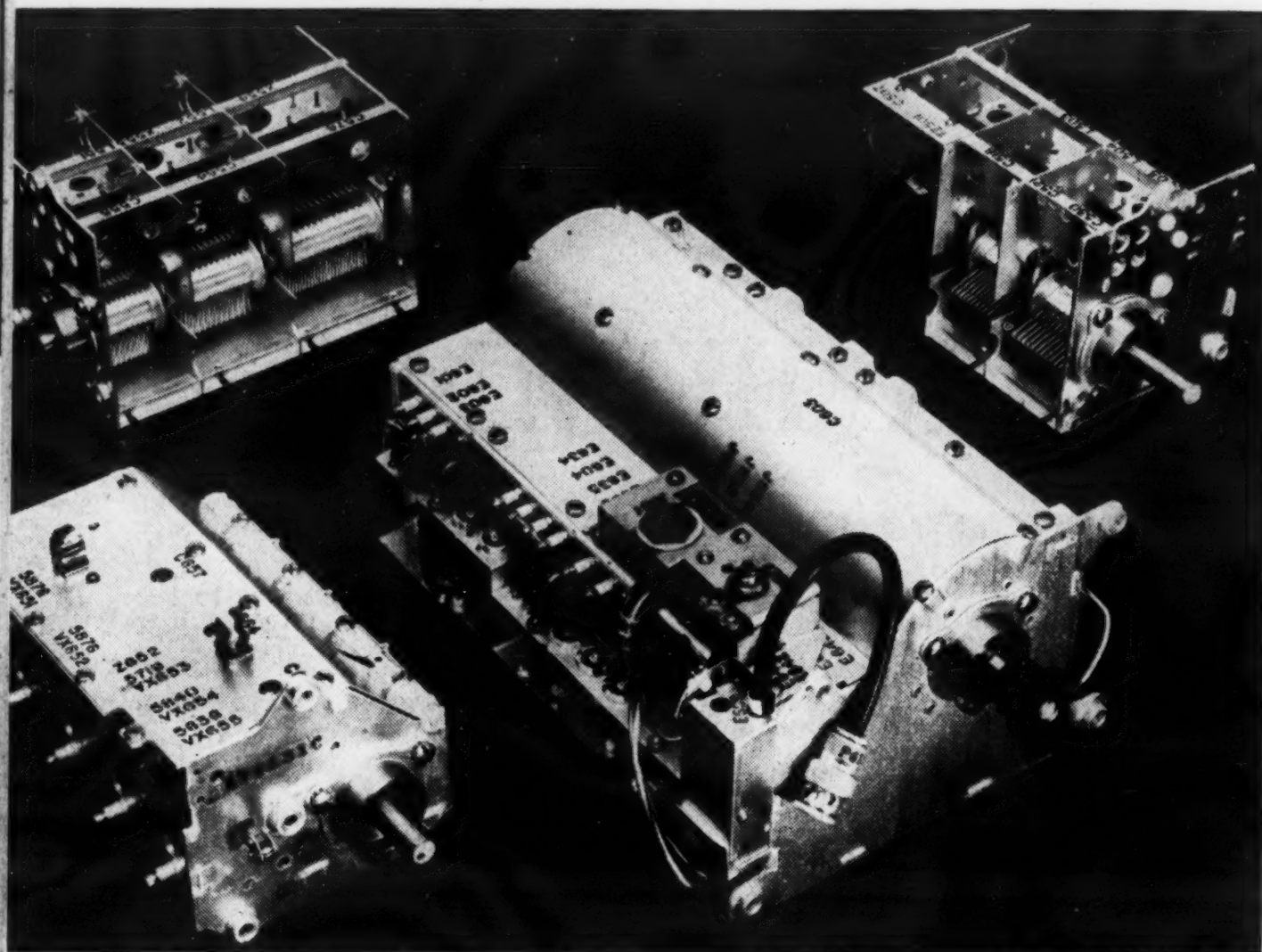
Other manufacturing facilities include plants at Watseka and Hoopes-ton, Illinois, where the greater percentage of all variable capacitors for home receivers are manufactured as well as auto radio tuners and items of special nature when required.

Radio Condenser Company services our neighbors in Canada with a completely modern and well-equipped plant in Toronto. The Canadian plant is set up to handle the commercial product line of components as well as Special Apparatus Division products and is closely tied in with all the latest engineering developments in this respect.

Service to customers has always been the keynote with Radio Condenser Company and to this end, sales engineering offices or representation is maintained in New York, Chicago and Los Angeles. Direct sales to manufacturers by Radio Condenser Company engineering personnel assures maximum customer service and strict attention to detailed requirements of all Radio Condenser products.

Continued growth in the overall electronics field is anticipated by Radio Condenser Company as part of its forward thinking in the development of new products and improved facilities.

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The above photograph of ARC-34 tuning cavities shows a completely wired and tested transmitter unit, in addition to a receiver, the exciter #1 and exciter #2 cavities.

full use of technical advantages in certain equipment and yet be practical for mass production and use under all conditions of military application. As a result of this development, a high percentage of the multi-section gang capacitors used in military communications employ designs having rotor sections isolated from each other by highly stable insulating material, permitting the equipment designer much greater circuit design latitude for better overall performance.

The design of variable capacitor type tuning elements to cover frequencies up to 400 mc represented another advance in R.F. tuning elements. A particularly interesting development was the five-section variable capacitor and drive mechanism designed for the original "Walkie-

research and development establishments. In addition to the main offices of the Radio Condenser Company at Camden, the Special Apparatus Division has its engineering and manufacturing headquarters there. The manufacturing division is housed in a modern, recently completed building designed for the most efficient handling and production of specialized, electronic assemblies and components. One of the major factors in the ability of Radio Condenser's Special Apparatus Division to render top service to customers is the scope of manufacturing operations and facilities included with the Camden plant. This includes a completely modern equipped tool room, punch press, screw machine, machine mechanical sub-assembly, soldering, brazing, automatic drilling, tapping,

Engineers from the Components and Materials Branch, Signal Corps Engineering Laboratories, test the ruggedized meters in a high impact shock testing machine for light weight equipments with 2000 ft-lb blows.



by A. W. Rogers

and

A. D. Bedrosian

Signal Corps Engineering Laboratories

The Development of Ruggedized Electrical Indicating Instruments

ELECTRICAL INDICATING INSTRUMENTS, referred to hereafter as meters, are components which by their very nature are expected to be handled carefully in both transportation and service. Early in World War II it was apparent that this component would pose quite a problem from a logistic standpoint. The Signal Corps and other concerned organizations in the military services took steps to alleviate the situation by every means at their disposal.

The ideal solution would be to improve these delicate and fragile components to the point where they would withstand the type of service normally associated with military applications. Because of the urgency of war production requirements this basic investigation could not be commenced until a more opportune time.

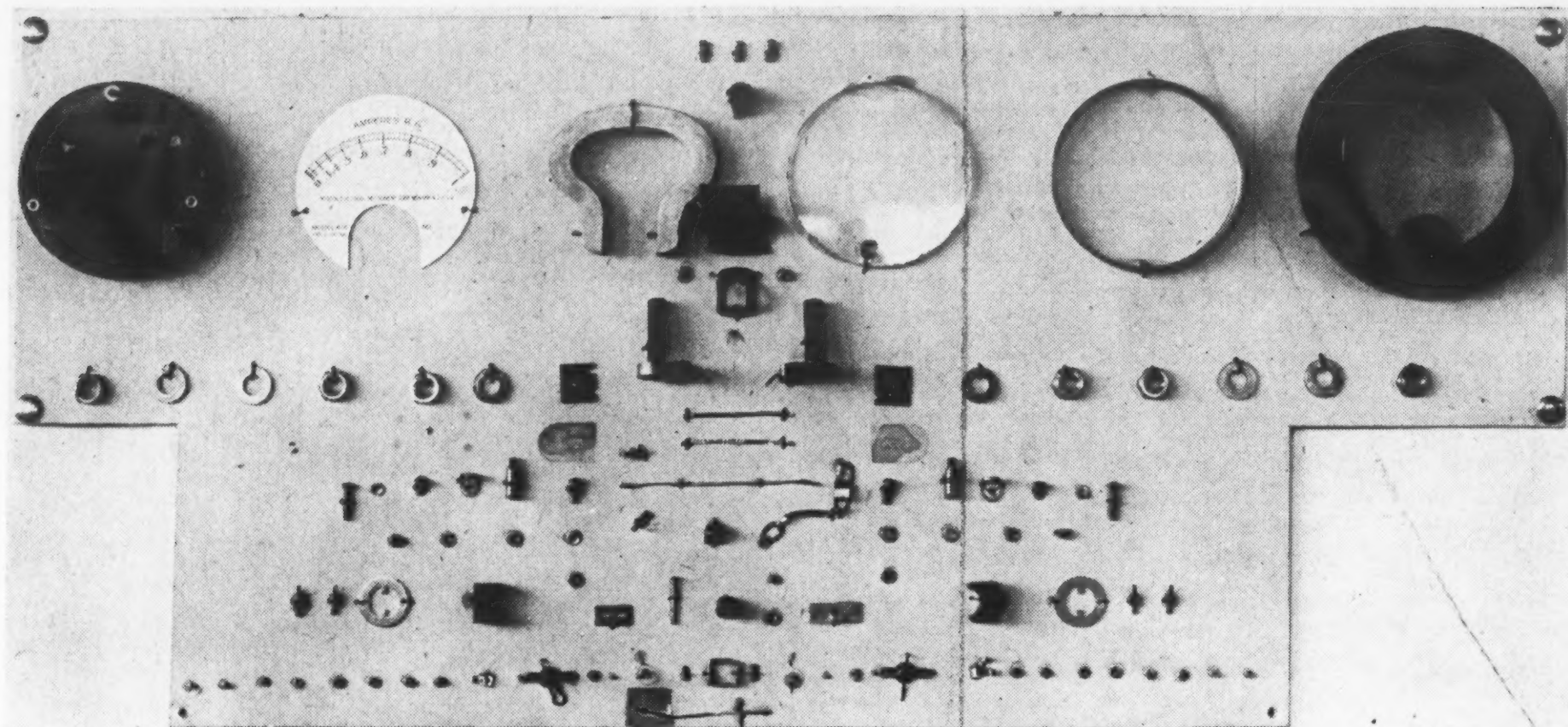
In 1946, based upon field failures observed and reported during the war and an analysis of tests and other experience gained in the laboratory, necessary performance requirements were prepared. These requirements

were embodied in a development specification and a development contract was awarded to the Marion Electrical Instrument Company in early 1947.

The research and development work initiated had as its objective the development of a line of panel meters in the more commonly used case sizes of from 1½ to 4½ inches. These meters were to be sealed against moisture and capable of withstanding extreme climatic conditions, severe shocks, vibrations and rough handling incident to 'round the world transportation and eventual use by the military. A set of test requirements was formulated which was considered representative of military service conditions. These test requirements may be divided into the following three major groups:

a. Physical checks and electrical tests to determine initial characteristics, assure adequacy of basic design and verify production uniformity.

b. Environmental tests to duplicate global climatological extremes.



This view of a dismantled commercial meter shows the piece-parts of a complete unit.

c. Ruggedization tests to simulate the rigors of transportation, repeated handling and use during combat operations.

One of the accompanying photographs shows the numerous parts which go to make up a self contained RF meter. Many of the 138 items shown require extreme precision in fabrication and, if the finished assembly is to have the desired accuracies of $\pm 2\%$ or better, it is a foregone conclusion that close tolerances and extreme care must be exercised in each step of production. Also, due precautions must be taken in transportation and use in order to retain the original characteristics of the instrument.

It was considered of foremost importance from the standpoint of the replacement problem that the meters to be developed under the contract be *electrically and physically interchangeable with existing standards*. Secondly, bearing in mind the supply situation in the event of large scale procurements, it was stipulated that, whether an entirely new type or an improvement over existing types, the meters developed must be *feasible for manufacture by mass production techniques*.

The first phase of the program, after award of the contract, was a survey of the state of the art. This included a literature search and evaluation of existing designs. A representative number of commercially available meters of various designs were subjected to the ruggedization tests to determine the nature and extent of damage sustained and their correlation with field failure reports. From these, it was evident that a completely new meter had to be developed, from case to moving mechanism.

Since the basic mechanism utilized for the $2\frac{1}{2}$ " size would, with some modifications, be applicable to the $3\frac{1}{2}$ " and $4\frac{1}{2}$ " case sizes, it was decided to concentrate initial effort on the development of the $2\frac{1}{2}$ " size. A successful prototype in this size would serve as the basis for the subsequent development of the others required. It was believed at the outset that the ruggedization of the $1\frac{1}{2}$ " meter would be comparatively less difficult because of the reduced mass but some additional design problems were anticipated in this category due to physical limitations of the case size.

The pros and cons of using vibration and impact force isolating suspensions were discussed with shock and vibration specialists and resulted in the decision to explore the possibilities of utilizing a rubber shock and vibration isolator as an integral part of the meter itself.

In this investigation an outstanding weakness in plastic cases and other parts made of plastic was noted. It was felt that while these parts could be sufficiently strengthened by the choice of high-impact plastics, increase of cross-sectional thickness and reduction of areas of stress, (as demonstrated later in the product engineering phase of the program) it was decided to utilize metallic parts whenever possible, at least in the experimental stages, in order to eliminate the need for molds.

The basic design parameters were now on the horizon: first, a steel case capable of being completely sealed; second, a shock and vibration isolator between the meter mechanism and the case; and, finally, a substantial reduction of the over-all mass of the meter mechanism, including a careful re-design of the parts to fulfill the ruggedization and other performance requirements.

Tests on Materials Provide Formula

The problems associated with rubber for use as an isolator were: (1) that the compound contain no contaminating or corrosive agent; (2) that it remain reasonably stable with regard to resilience, flexibility, durometer change, etc. within the wide temperature limits specified in the test; (3) that it be bondable by ordinary means to steel and brass; (4) that it have sufficient tensile as well as shear strength, and (5) that it have suitable dielectric properties.

After exhaustive tests on materials for use inside the meters the following formulation was determined to be acceptable.

Smoked Sheet	100.0	Parts
M.B.T.S. (Altax)	1.0	Parts
Guantal	.025	Parts
Sulphur	2.0	Parts
Zinc Oxide (Kadox #15)	4.25	Parts
Whiting	15.0	Parts
Pellotex	5.30	Parts
Stearic Acid	0.33	Parts
Agerite Powder	0.33	Parts
Light Ciro Oil	3.0	Parts

It was considered advantageous that not only the over-all mass or the magnet be reduced but also that it be adequately "anchored" in place. An Alnico V magnet of the smallest physical size but having the necessary energy product was selected. To remove the cantilever effect of the two-point magnet mounting customarily used, three

point mounting was decided upon. Anchoring was accomplished by the use of a retaining bracket secured to an "anchor-plate" molded within the isolator. It was further stipulated that the magnet assembly be balanced as near the center of gravity of the case as possible. Along with the use of a smaller size magnet it was, of course, necessary that the core and bracket assembly be redesigned. The dial was to be secured with three-point mounting in an attempt to afford uniform stress distribution.

Since brass screws were extensively used in meter assembly and their almost invariable loosening was observed in the design evaluation tests, the subject of screws, lockwashers and fastenings received careful consideration from the very beginning. The "digging-in" feature on which lockwashers depend for preventing loosening of screws would, of course, be ineffective on Alnico V. For this reason a brass retaining bracket was designed to confine and adequately secure the magnet as desired.

Based on the design parameters which were firmed up to this point, namely; steel case, rubber shock and vibration isolator molded to the case, meter mechanism of reduced and balanced mass, securing the magnet assembly to an "anchor-plate" and the dial at three points, a number of samples were made and subjected to the ruggedization tests. The results were very encouraging. At least some meters went through the vibration and tumbling

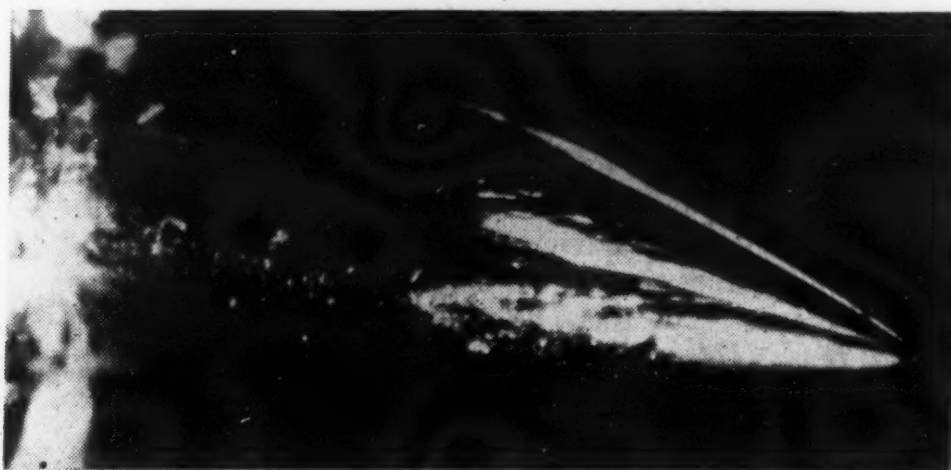
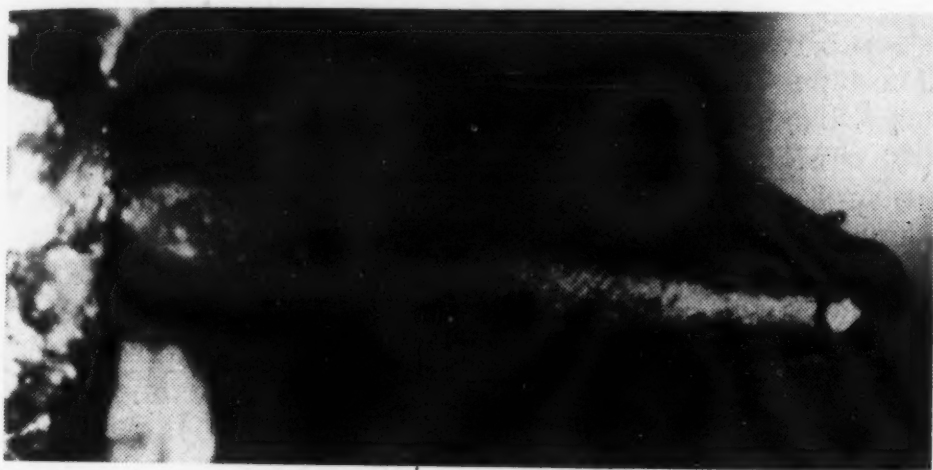
of maintaining the completely assembled mechanism at $+50^\circ$ to $+60^\circ$ for a period of six hours—zero shift was virtually eliminated.

It was found essential that the core which is held by the bracket be further secured or supported in such a manner that it would not shift from its original position under the stress of the high impact shock test. For the same reason the bracket itself, which in addition to supporting the core also serves to retain the top and bottom jewels, had to be redesigned to assure freedom from distortion or deflections. Since the moving coil rotates around the core, any deflection of the core or distortion of the bracket would raise havoc with the very heart of the meter, the moving coil.

Illustrated is a representative moving coil assembly. Very fine copper wire enamel-insulated and of the order of .001" in diameter is often used for the coil itself. Two small plates are cemented, one each to the longitudinal ends of the coil. These plates have a spring anchor lug of minute dimensions staked on and fine steel pivots are force-fitted in place.

A pointer assembly, including a balancing cross, completes the assembly. This assembly is supported by glass or sapphire "V" bearing. Improvements were achieved with respect to the pivots, pivot plates and pointers without any added complication of manufacturing processes.

A new pointer was developed based on the principle of



To the left is a photograph of a pivot which has mushroomed during the tests on the meter. After careful engineering, special "Elgiloy" tipped steel pivots were found to withstand rugged treatment. The photograph on the right shows a good pivot after tests.

without loosening of parts and other breakdowns and also survived even the 2000 ft.-lb. high shock tests without the meter mechanism's flying out or falling apart.

The principal items which required further attention included: excessive zero shift, mushroomed pivots and damaged jewels, uncementing of pivot plates, bent or broken pointers, dial colliding with side of case, deformation of case flange and breaking or splintering of observation window glass. Intensive effort was now concentrated on the analysis and elimination of these failures.

Zero Shift Difficult Problem

Up to 15% zero shift was observed in some test specimens, particularly in sensitive low torque mechanisms using conventional phosphor bronze springs. Factors contributing to this condition were found to include the presence of internal stresses in the control springs due to drawing processes or assembly procedures, mechanical distortion of the convolutions under shock impact and vibration and the dislocation of the various piece parts which constitute the zero adjusting assembly. Parts were redesigned to eliminate any mechanical unbalance condition which might tend to cause dislocations. Because of the higher modulus of elasticity it was thought that beryllium copper might be superior to phosphor bronze and worthy of a trial. To assist in preventing "fouling" or snarling of the convolutions the number of convolutions (hence over-all diameter) was reduced. Finally, with an ageing or "normalizing" treatment—which consisted

the multi-section fishpole or telescope construction. This design using 52 SH aluminum tubing was quite satisfactory for the purpose. The original pointer would support only a 6-gram load whereas the new a 19-gram load.

Pivots and jewels were the subject of much concern. Deformation of the pivot at the cone apex such as blunting or mushrooming was observed to be the result of impacting between the pivot and its bearing. When glass bearings were used the damage to the pivot apex was less severe but the glass bearing itself suffered considerable damage such as severe granulation, cracking and piercing. When sapphire was used while damage to the jewel itself was much less evident the degradation of the pivot was excessive.

Pivots with apex radii of .001" to .005" were tried. As a general rule pivots with the greater apex radii suffered less degradation but due to increased friction pivots having apex radii greater than .0025" were not found satisfactory for use in small low torque panel meters. In connection with this, "shock-protected" jewels were tried. These were found to be effective to some extent in minimizing pivot and jewel degradation.

It should be noted that in any problem involving pivots and jewels one cannot be considered without reference to the other and the pair without reference to the weight of the moving coil assembly and the design of the jewel retaining parts. In the original development it was found that "Elgiloy" tipped steel pivots with a 55° cone angle

and apex radius not in excess of .0025", used in conjunction with glass jewels, would be acceptable for most ranges. Subsequent investigations and experience has shown that steel pivots of .0015" apex radius and glass jewels backed with silicone for shock protection purposes can be very effectively used.

Uncementing of the pivot plate often occurred as a consequence of tumbling or shock tests. In investigating this failure it became apparent that the cement employed was not adequately cured even though a 6-hour air drying and a 6 to 8 hour baking at 300°F was accomplished. Experimentation showed that if a 200°F 2-hour preheating was followed by a 1-hour 350°F curing a much more satisfactory bond would result. In addition, the air drying period could be reduced to a 5-hour period for this operation.

As more and more samples were tested to determine the effectiveness of the solutions to the various problems it became apparent that not only were we on the right track but that our objective was already within grasp. Finally design details were stabilized and parts ordered for a group of 2½" meters embodying the new designs and improvements developed to date. These samples were made as uniformly as possible with the temporary jigs, tools and dies rushed for the purpose. These units were to be subjected to *all* the ruggedization tests in sequence required by the specification.

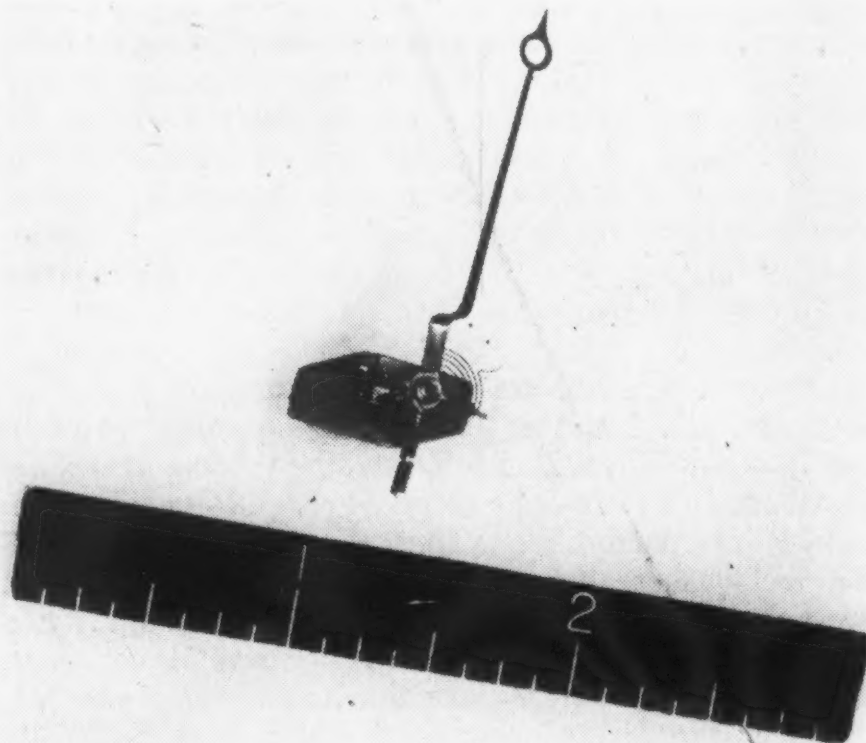
Tests Successful, Production Begun

One day the samples were finished and, after a record was made of their initial characteristics, sent to the test laboratory with instructions to "give 'em the works." After six hours of the prescribed vibration testing the answer came back "no failures."

While all samples did not survive all the tests, most did. The nature of these failures were such that it appeared reasonably certain they could be eliminated by the use of production parts, adherence to quality control techniques and good manufacturing practices.

This final design was frozen for the 2½" size and preparations were rushed to produce the various samples of this size specified in the contract.

The development of the 3½", 4½", and the 1½" sizes



The moving coil assembly, above in actual size, a delicate type of construction, needed special attention during the development of the ruggedized meters.

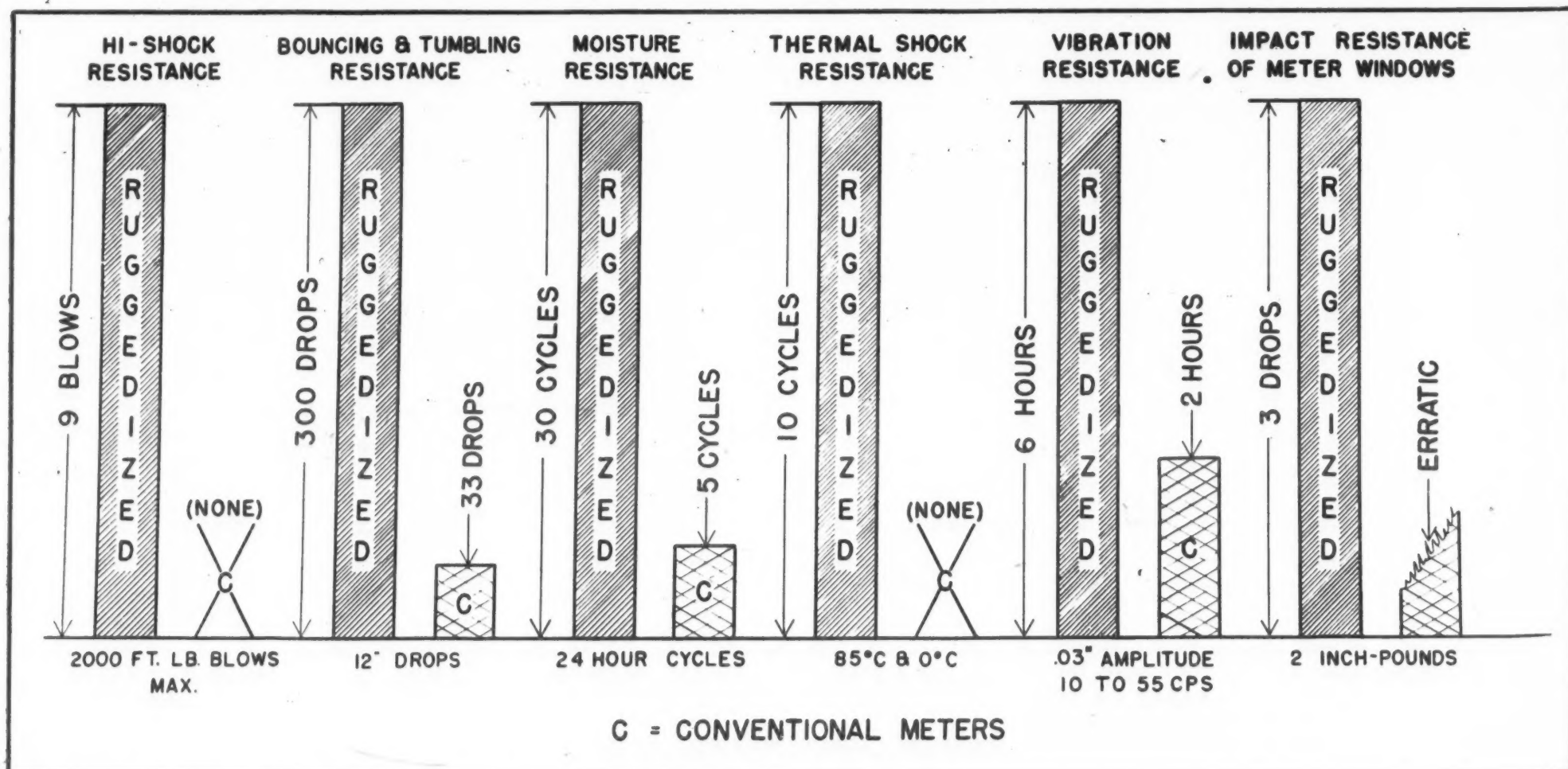
was taken up in that order using the successful 2½" design as the basis. Some problems were encountered as anticipated, but as a result of nearly three years of work a basic design was developed which fulfilled in essence the aims and objectives of the original program. The types included both dc and nominal 60 cycle ac, and sizes from the miniature 1½" to the 4½" multi-range test equipment size.

No sooner than the evaluation of the developmental samples was accomplished, the tentative specification was modified as appropriate and a procurement specification, MIL-M-10304 (SigC), was published in May of 1950. By the middle of the year the first contracts were being let for the purpose of educating industry in the know-how necessary to produce ruggedized meters in large scale production quantities.

This phase of the program was in effect a combined product engineering and mobilization preparedness phase.

(Continued on page 58, col. 1)

This chart compares the performance of ruggedized vs. conventional meters undergoing the same endurance tests. The results proved conclusively the effectiveness of three years spent in the development of the ruggedized, "shock-proof" meters.



Prodelin Inc.

"Job-Packaged" Antenna Systems

PROPAGATION OF RADIO FREQUENCY energy through free space is daily assuming a more important part in our radio communications industry. Three basic operational phases of radio communications required to transmit intelligence between two or more locations involve, first, the generation of a signal with definite characteristics, next the propagation of this information through space, and finally its reception in a clearly understandable condition. Prodelin chose to pursue the propagation phase of the radio art and has developed and pioneered during the past 10 years "Job-Packaged" Antenna Systems.

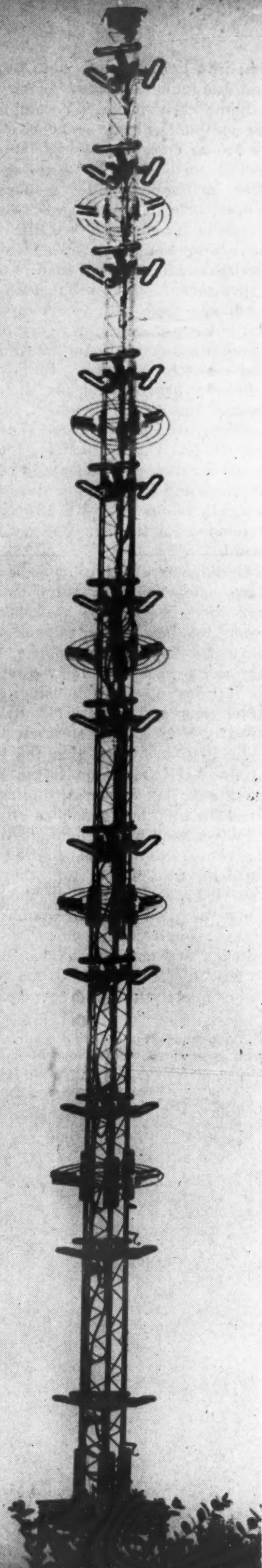
The "Job-Packaged" System, with its associated single source responsibility, has now proved to many users the value of procuring matched transmission lines and tailored propagation elements to assure maximum use of precious RF powers with a minimum of signal distortion. Prodelin can now place at the user's disposal these antenna system facilities and field experience dictated designs, ready to handle most standard or

This new twelve-bay high gain "Tri-Loop" antenna for VHF television broadcast service was recently developed by Prodelin. →

special propagation requirements from the output of the transmitter to the antenna at the top of the tower.

Unwilling to admit there was any obstacle too great to overcome, Product Development Company therefore incorporated in 1945 as one of the many new companies starting in the State of New Jersey, with fond hopes for the future. The incorporated company name was later discarded in preference for the coined name, *PRODELIN*, which everyone seemed to find easier to say as well as to remember (especially the PBX operators). In those early days its founder, and present president, Lew Bondon, solicited small military and commercial applied development assignments in the field of dielectrics and became involved in an assortment of applica-

With a ten-year plan, lots of spirit, youth and hope, some war bonds and a home to mortgage, Prodelin's founder, Lewis A. Bondon, believing that practical product design, reliable manufacturing methods, friendly engineering and service would spell the right combination for success, struck out to achieve new product recognition — and his dream is coming true!



tion investigations into both organic and inorganic materials.

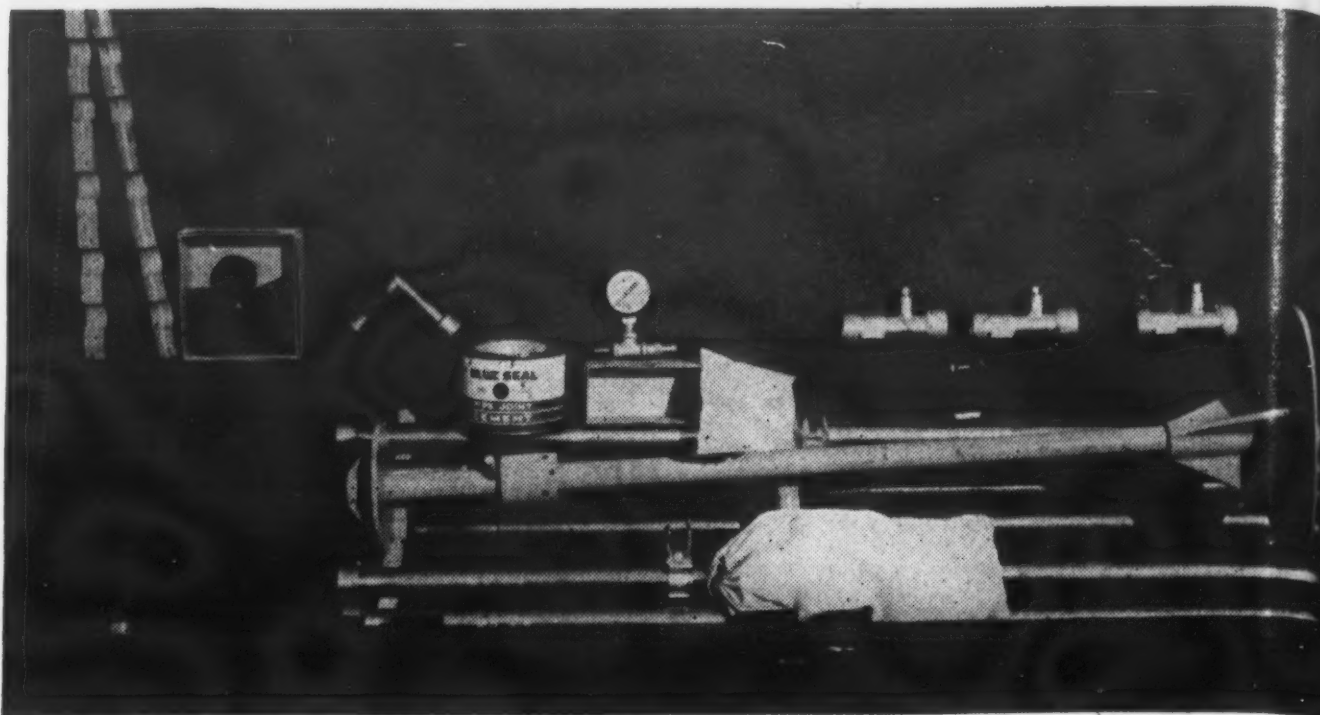
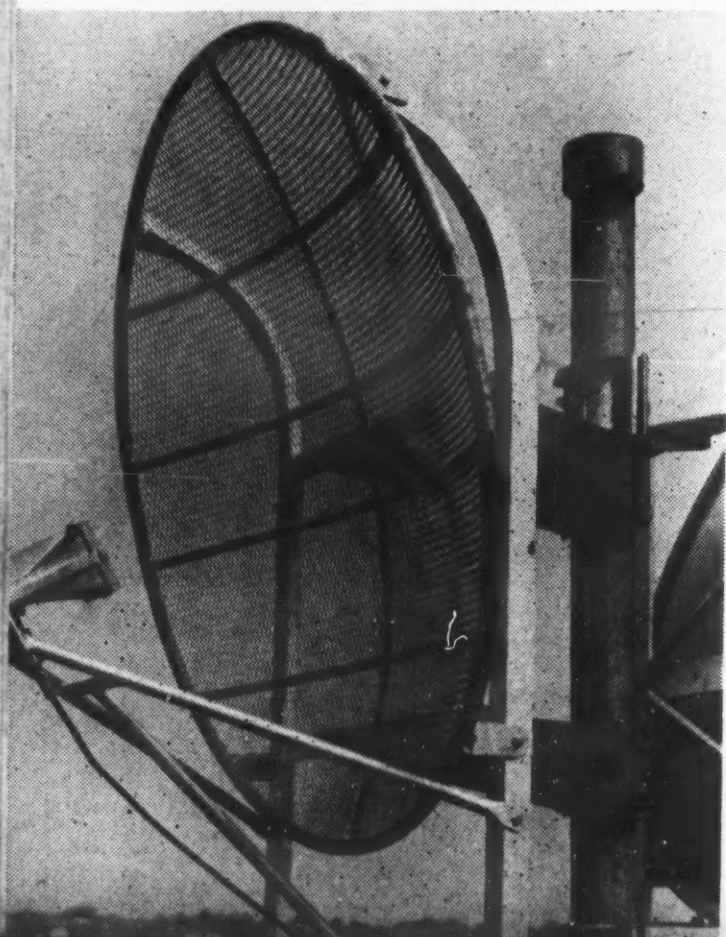
Some early projects accomplished for various military agencies included the development of high and low tension cables designed to operate over extremely wide temperature ranges, primarily for use by the Air Force in jet aircraft. For the Navy there were low loss solid and air dielectric coaxial cables which required improvement and refinement and work was done with the Army-Navy Radio Frequency Cable Coordinating Committee to coordinate the RF cable and connector interests. BuShips required a broad band air dielectric coaxial line which Prodelin readied for their use. This became known as the RG-128/U. A flexible, low capacity air dielectric cable with rugged physical and high temperature characteristics, now Type RG-134/U, was developed for the Air Materiel Command.

Certain early designs, considered to have prime novelty, were patented and then licensed to various companies for their further use and manufacture. This licensing policy in the beginning provided the wherewithal to fertilize other roots which were developing and allowed Prodelin to investigate new market interests.

In 1946 it seemed that the lifting of the VHF television freeze would make a market worthy of interest and Prodelin therefore made an effort to establish itself in this field. This was the only commercial market that Prodelin entertained, for other than experimental interest, at the time. They pursued this television field right through to the microwave relay antenna systems, which also seemed to have a definite place in the future.

Fortunately, Prodelin was equipped

This Prodelin offset horn fed mesh reflector pipe is mounted for traffic control on one of the nation's newly developed turnpikes.

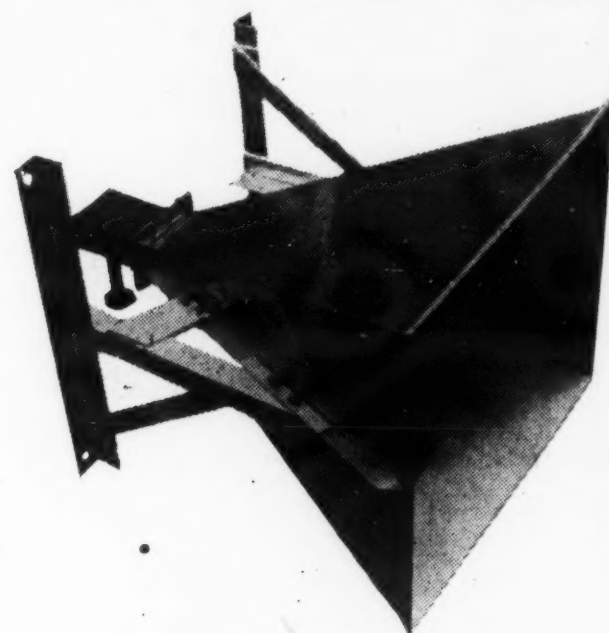


A "Job-Packaged" microwave assembly kit includes all transmission lines, dipole antenna, fitting tools and accessories that are required at the field site to install a complete antenna system.

with the commercial Series "800" broad band transmission line, similar to the BuShips RG-128/U, which proved the wedge to open the door of acceptance with the major equipment manufacturers then contemplating their first commercial installations. In 1947 a certain pattern was developing which indicated that changes in the Prodelin operating policy should be made. These changes were somewhat dictated by the economies of the time, as well as the belief that the manufacture of a defined product line should be associated with the company's name for recognition in the future. From the standpoint of survival this seemed to be the better course, rather than to continue with the development of products for licensing to others. With this decision agreed upon, Prodelin started to develop its product line and immediately new plant and laboratory expansion plans were formulated as part of the overall pattern for the future.

In 1948, with the early development of commercial microwave systems for telephone and telemetering applications, it was obvious that quality performance would be required. Prodelin's first experience in this field was in the Keystone Pipe Line Company installation in Pennsylvania where they were exposed to a number of new and interesting field problems. In 1949 the Trunkline Gas Company, Texas Eastern Gas Transmission, and Michigan-Wisconsin Gas Pipe Line all resolved their preference for 2000 mc microwave systems and each installed more than 1,000 miles of microwave facilities combined with 50 mc VHF for local servicing. In 1950 the Bonneville Power Administration and Southern California Edison both installed 2000 mc microwave systems and again

Prodelin was able to handle these requirements on the West Coast, and, at the same time, further test their equipment under more rugged weather exposure. These systems have since proved satisfactory and the customers have further extended their facilities to include more Prodelin antenna systems. Tennessee Valley Authority and many others have elected 2000 mc for microwave facilities and have repeatedly extended



A horn antenna for point-to-point microwave transmission is used where the increased windload of the high gain parabolic antenna is not tolerable.

their operation, always including Prodelin antenna systems.

Early field experience soon indicated that the advantages of Prodelin "Job-Packaging" were rapidly becoming an apparent necessity to the end user. It is seldom that one takes time to go into the field to listen to the complaints of erectors for the purpose of modifying a product design to overcome such complaints. However, Prodelin did this and as a result has won the favor of the end user as well as the erection people who handled these materials. Years of all-

weather field service experience proved an invaluable education even though it involved trouble corrections which are considered reasonable and normal in any new field of operation. Via exploration of ice-incrusted towers, requiring hammers and golf shoes to climb, or cloth lined leather gloves when towers were too hot to handle, Prodelin learned that product reliability was mandatory for uninterrupted, trouble-free service, if customer satisfaction and re-use was anticipated.

1951 was the advent of a new type of television operation known as

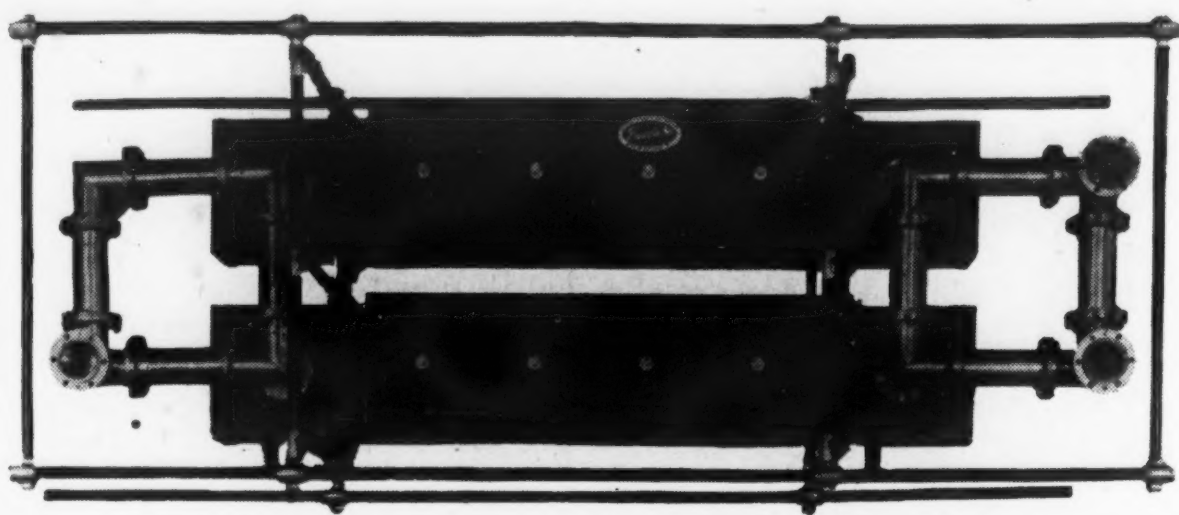
performance on their own test sites under the observation of consultants, equipment manufacturers and the end users, Prodelin was able to convince the field that their product was worthy of consideration and as a result gained respect and business.

In 1952 both UHF-TV waveguide and coaxial transmission line developments were further refined by field experience when numerous unforeseeable system problems, peculiar to high power, were experienced. Again the features of a complete engineered package to assume a single source of responsibility were recognized and

activities and minimizing labor and material handling costs.

In early 1954 Prodelin's "Job-Packaged" experience indicated it was necessary to manufacture and include in the package an all-aluminum microwave tower for the purpose of minimizing field complications which continued to occur because of dimensional non-compatibility between tower structures and antenna systems equipment. In view of this a new metal fabricating plant was procured and contracts for the application of this new microwave package with the military service, both domestically and overseas, were taken. These towers are now installed in service and have already withstood two hurricane blows in coastal areas.

Prodelin will continue its pioneering effort further to secure the confidence and position in the industry it wishes to attain. They have been shaping their pattern for success with confidence and determination, aided by the combined efforts of its many hard workers. The product line development program is now nearly accomplished, ready to handle tougher "Job-Packaged" antenna systems in the future. . . .



The Prodelin teleplexer device separates and feeds aural and visual signals to a common transmission line in UHF television service.

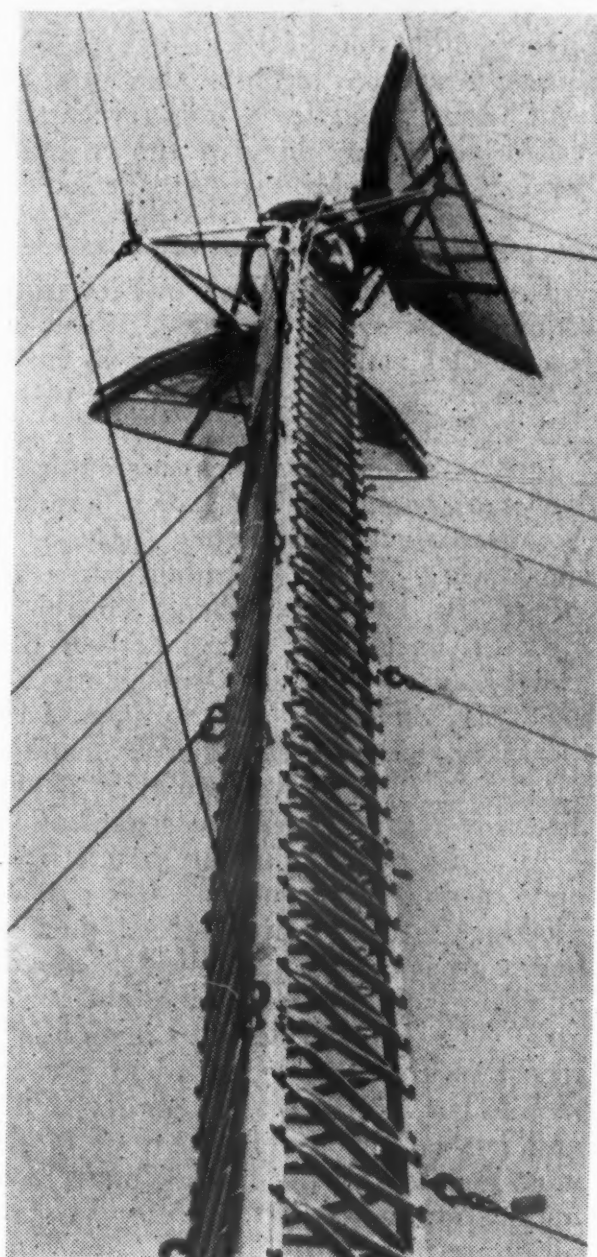
UHF in the high band region 400 to 900 mc. Here Prodelin found a ready market for its now service-proven band lines in the larger diameter versions to handle higher power requirements. UHF-TV interest continued to expand to a point where certain requirements indicated that only high power was the solution when combined with high tower operation. Appreciating the mechanical and electrical problems in long line systems on high towers, Prodelin pioneered and manufactured large waveguides in the standard RETMA sizes, WR-1150 and WR-1500, in both the copperclad steel and all aluminum versions. These waveguides have been in service since 1951 on towers exceeding 1,000 feet in height and perform satisfactorily in commercial applications all over the country.

Paralleling their physical growth at this time, Prodelin was constantly working to impress the end-user of their performance ability and to cope with the difficult job of being able to perform sales-wise against competition. Competition had been established for many years and their performance reputation alone was often a sufficient sales factor to make Prodelin's road more difficult to travel, especially when the products offered usually included different design features than those previously used. However, again by proving electrical

further developed. Combined field experience and observations were now proving valuable in getting the Prodelin story accepted. However, it involved an extraordinary effort to develop finally, within Prodelin's projected 10-year program, a planned product line including antenna equipment, transmission lines, diplexers, towers, etc. Economically, "Job-Packaging" offers the user many advantages by minimizing procurement problems, coordinating traffic and erection schedules, and placing with one source the responsibility for all planning details and performance guarantees.

In 1953 the BuShips and the Signal Corps awarded Prodelin large development and production contracts for antenna and transmission line equipments. These awards helped considerably to improve the company's position in the industry. In 1953 Prodelin combined all manufacturing and engineering facilities under one roof and a new plant was erected in Kearny, New Jersey. This location, near to the metropolitan New York area has proved to be a very effective combination from transportation, material and labor supply standpoints, for an efficient operation. There also are established in Kearny antenna ranges for checking the performance of manufactured equipment thus centralizing production and engineering

This antenna system was assembled rapidly in the field from a "Job-Packaged" microwave antenna system which included mesh parabolic reflectors, all-aluminum tower, feed lines, prefabricated guy assemblies, hardware and tools.



Integration of Communications

At a recent meeting of the AFCA Scott-St. Louis Chapter, Admiral Ammon presented the pros and, especially, the cons for the often suggested program of a combined communications service in the Armed Forces.

TODAY, THE COMMON USE OF COMMUNICATION CHANNELS by more than one service of the Armed Forces is recognized as a tremendous economic advantage to our military communications.

A few years ago cross-servicing of communications among the U.S. services, as we employ it now, would have been impossible. Adoption of common operating methods and procedures solved that problem.

Further, the United States has offered these common operating techniques to our allies. They have been accepted. As a result, the fighting forces of the free world have crossed language barriers to communicate with one another more efficiently than was ever thought possible.

The tools of military communications are being standardized. From a practical point of view, I believe that, basically, effective integration of military communications is an accomplished fact.

Of course, I realize there are some who will disagree with me. There have been, and are, advocates of one communication system for the armed services—advocates of a complete combination of all military communications. Some advocates suggest a military communication service under one head. Some visualize a military communication service patterned along the lines of the Military Sea Transportation Service and the Military Air Transport Service.

Reasons Against Merger

The proponents of these merger proposals come from Government offices, the Congress, retired officers' groups and the commercial world. It appears to me that the advocates of such a merger neglect or ignore two fundamentals of military communications.

In the armed services, communications is primarily the "voice of command" and the "handmaiden of operations." A commander, be he Army, Navy, or Air Force, who cannot speak when he wishes, cannot successfully conduct his operations. He must have direct control of his communications. He must be able to assure himself that his communications are reliable, secure, and sufficiently rapid for his particular needs. He must be able to control the order in which his messages are to be handled. He cannot entrust his communications to an organization over which he has no power of direction regardless of the organization's good intentions.

Also, the communication system of each service was developed to meet the needs of that particular service in accomplishing its own individual mission. I believe mobility has had a great deal to do with the direction of growth. Closely allied to mobility is the medium in which each service operates. The Army, relatively immobile and land bound until recent years, grew dependent upon wire. The Navy, a mobile but relatively slow service in a fluid medium, fostered and pushed the development of radio. The Air Force, the most mobile and the fastest, must have the most rapid communication means if today's and tomorrow's speeds and mobility are to be fully utilized. Consequently, to me, to merge

the three communication services, would be similar to an attempt to merge three industrial concerns manufacturing diverse and different products, in an effort to produce one product which would satisfy the dissimilar requirements previously fulfilled by the three separate products.

The Navy does not designate circuits administrative or operational. All circuits are considered operational and the primary reason for their existence is to serve the fleet. A secondary reason is to aid in administration. Communication with ships at sea is conducted by the broadcast method from certain shore stations. The shore stations transmit at known times on known frequencies and ships copy the traffic. Each command or ship selects the messages addressed to it, reproduces and distributes them for information or action. The ships do not receipt for traffic and thus are able to conceal their locations. There are ship-to-shore frequencies which are used when a ship needs to send messages ashore. There are also intership and task group or force frequencies which are used by forces at sea. All shipboard transmitting frequencies are used only under such restrictions as are ordered by the senior commander. During wartime ships ordinarily operate in radio silence so as not to disclose their positions. Naval communications are designed to take full advantage of concealment and surprise.

The Navy also has a chain of direction finder stations which are used in peacetime for sea, air and maritime rescue. During war they serve to locate and track enemy forces, air or naval, which may use radio.

These requirements of naval communications are fundamental to the success of naval operations. They are peculiar to the Navy and are not shared to a marked degree by the other services.

There is the additional difficulty fundamental in the three departmental organizations. The military departments are differently organized and the functions and responsibilities of the Chief Signal Officer, U.S. Army, the Director of Communications, Air Force and the Director, Naval Communications are not the same.

Also, there are practical difficulties such as the physical limitations on sizes of buildings and antenna fields.

In fact, communications in this case are somewhat analogous to a statement made by Secretary of the Navy Thomas. Mr. Thomas, then serving as Assistant Secretary of Defense, was discussing the development of the single stock numbering system for the Department of Defense. He stated there was to be, not a single catalogue, but several catalogues: one for the items that all three services use; others for items used by two services; and still others for the 60% of all military items that are used by one of the services.

Problem Present From Early Days

When treating a subject it is always interesting to go back into ancient history—particularly when this history supports your position. During the Civil War a means of telecommunications had just been developed—the telegraph. The

War Department attempted to operate this communication system under civilian auspices. This was a complete failure as you know, for I am sure you have all read the article on Civil War Signals featured in recent editions of *Signal*.

In 1898, when the first radio installation was brought to this country, the Navy immediately became interested in this new medium of communication. In 1904, President Theodore Roosevelt appointed a board to study the radio activities of the various departments of the Government and to make suitable recommendations regarding their development. This board recommended that existing radio installations of certain other departments be transferred to the Navy Department, and that the Navy should maintain and operate a complete chain of coast signal stations, and should transmit all messages for other Government departments. The War Department was to operate shore stations in military areas as part of the national defense and cooperation between the two departments was to be complete. These recommendations were approved by the President and from this more or less unified communication system, we have developed the present day organization. The recommendation of the Roosevelt Board for cooperation between the services in communication matters has been and still is being carried out.

Just before World War II, the United States Joint Communications Committee was formed. On 13 August 1942 this was reconstituted as the Joint Communications Board. The Joint Communications Board was organized as a supporting agency of the U. S. Joint Chiefs of Staff for the purpose of making recommendations to the U. S. Joint Chiefs on U.S. communication policies and to aid in correlating these policies with those of the Combined Chiefs of Staffs of the Allied Forces.

In 1949, the McNarney Committee, Office of the Secretary of Defense, began a strong move for the establishment of an integrated system to be known as the Armed Forces Signal Communications Service. This service would have authority over all point-to-point communication activities, wire and radio, required for the administrative needs of the national military establishment. The three services agreed that this was unacceptable "because communications is a function of command and the services would be dependent upon a separate service for communication needs." We must keep in mind that in the Armed Forces, what is an administrative circuit today will probably become a tactical circuit on the outbreak of hostilities.

C&E. Advisors Established for Joint Chiefs

As a result of this study and many questions posed by Mr. Forrestal, the Office of the Director, Communications-Electronics was established. He acts as chairman of the Joint Communications-Electronics Committee, formerly the Joint Communications Board. This action was taken to insure the maximum economy and efficiency of communications and to strengthen the direction and coordination by the U. S. Joint Chiefs of Staff of communications-electronics activities.

In the spring of 1953, a memo entitled, "Improved Organization and Procedures for Handling Telecommunication Matters" sent to the then Deputy Secretary, Mr. Kyes, recommended the establishment of a telecommunications advisor to the Secretary of Defense. This function has been included in the newly established office of the Assistant Secretary of Defense (Supply and Logistics). This Assistant Secretary of Defense has among other responsibilities that of "formulating policies and systems in the fields of communication services . . ." You will note that his responsibilities do not include the operational communication fields of the services.

As you can see from this short resume, in recent years the Armed Forces have proceeded along the line of integration of communications instead of merger. Integration does not necessarily mean standardization. It means compatibility. Actually, our nearest approach to a merger of communications is presently referred to as "compatibility" of systems.

To me this means much more than just one unified system within the Armed Forces. It means the usage in common,

where it is expedient, of facilities of any of the services; and, consistent with security, facilities of the commercial concerns wherever a saving will result. At the same time it allows each service to maintain its "voice of command" under its own commanders, a prime necessity for military success.

The Department of Defense has promulgated the "Principles for Joint Communications." These principles state, in general that:

Economy of force demands that each commander make the most efficient use of personnel and material available to him;

Between the services, it is advisable, whenever practicable, that only one service maintain over-all communications facilities and channels for the use of other services;

When a single facility or channel is to serve more than one command it shall normally be under the command of the service having primary interest and that service shall have the responsibility for the operation, maintenance, and security control of the activity or circuit;

Common use of communication channels by more than one service will be the normal practice;

Joint operation depends upon efficient joint communications and these in turn are dependent upon the adoption and use of joint methods and procedures;

Insofar as practicable, communication equipment be standardized;

In research, development, and procurement of communication equipment, unnecessary duplication must be avoided by the use of joint contracts, cross-servicing, and cross-procurement.

The Joint Communications-Electronics Committee operates under these principles and under its auspices many service actions have been taken which result in economies and the elimination of unnecessary duplication.

The work of the Joint Communications-Electronics Committee is a continuing affair. It is continuously working on such matters as engineering criteria, communication planning factors, and the requirements for alternate facilities to insure against failures.

As a result of its efforts many problems have been resolved, among which may be listed:

Joint operating procedures and joint military characteristics for communication equipment:

An Armed Forces Courier Service has been set up;

Research and development projects are assigned to the individual services;

The review of plans for new or major extensions of communication-electronic facilities and installations;

Test equipment has been standardized;

Provisions have been made for extending cross-servicing, even to the training of personnel;

Provisions made to have one joint agency for the coordination of our Armed Forces communications with our allies.

Commercial Facilities Under Program

Of course all of you are interested in these efforts to save the taxpayers' dollars and in the proper coordination of the Department of Defense communications but those of you here who are connected with commercial communications also might like to know how this integration affects you.

In this respect, the Navy's policy is to use commercial facilities as much as possible consistent with economy but to insure the existence and availability, upon the outbreak of war or other national emergency, of a Navy-controlled system adequate to meet the Navy's requirements for national defense.

This Navy-controlled system must be maintained at such a size and be so organized as to provide facilities for immediate use. We must maintain an organization in peacetime for training and as the "hard core" for expansion if and when mobilization might be necessary.

In conformance with this policy the Navy is a large user of commercial equipment.

(Continued on page 58, col. 1)

KOREAN SIGNALS



THE COMPLEXITY OF COMMUNICATION WITHIN THE Republic of Korea Army is a tribute to modern-day methods of teaching. Communication, an essential must for an army of any size, has successfully linked together the tough, hard-hitting battle force that is found in today's ROK Army.

Signal training courses, patterned after methods of instruction used by U.S. Signal instruction centers, were set up for the ROK Signal Corps under the guidance of members of the Korean Military Advisory Group (KMAG). The advisory group, has guided ROK Army training since July 1, 1949, and advisors have worked tirelessly to develop signal units and staff them with superior and efficient graduates of signal courses.

The bulk of ROK Army Signalmen (89%) are trained at the Korean Army Signal School, one of four major schools at the Korean Army Training Center, near Kwangju. The Signal School is organized purely on functional lines to supply the need for various signal specialists throughout the vast network of communications in the ROK Army.

Not only do KMAG advisors check the progress and training of students, but classes are conducted for the

ROK instructors. Better methods of teaching, guidance, and familiarization of different phases of school training are taught to make instructors more proficient in their duties. Two hours of the instructor's 10-hour day is spent in personal instruction classes.

Officer students come to the school after a 16-week Infantry OCS course, and from front line combat units. The enlisted student arrives from one of the Replacement Training Centers after a 16-week basic infantry course, and also from front line units. Additional students are trained in communications for Artillery, Engineer, Armored, Infantry, and Military Police branches of the ROK Army. Students are also trained for the Korean Navy, Marines, and Air Corps.

Educational background of the students averages five percent college graduates, five percent high school, and forty percent having completed the third grade. Other educational grade levels average two percent each, with another two percent having no formal educational background. Illiterates are given a two week course in the "3 R's" of the Korean language before starting in regular signal courses.

Courses are divided into three main branches. Students

by Sergeant Julian D. Wheeler



↑
Pole-linemen are taught on ground level before taking the "aerial" part of the course. Pfc. Chung Kyn Kwan, Signal School instructor, points out the proper method of securing telephone wires to insulators.



←
Code reproduction machines in the central code room of the Signal School are checked by Sgt. Lee Yong Sik to be sure they repeat code groups at a set rate of groups per minute for students who are studying a new language of dots and dashes.

with high and average intelligence are usually placed in the radio branch which teaches more complex subjects such as very high frequency, radio repair and maintenance, radio transmission in code and voice waves. Elementary grade students are placed in the common subjects branch, teaching the communications chiefs, power equipment and maintenance men, message center, and supply courses. Remaining students are placed in the wire branch; pole-line construction, carrier-repeater, wire chiefs, telephone installers and repairmen, switchboard operators, and basic and field linemen.

U.S. Army Signal training manuals were translated and printed in Korean. The primary reader used to train illiterate students is a copy of a picture-word illustrated book used in stateside primary schools. Motion pictures and training aids are very helpful in showing the student the basic facts of equipment operation. Working materials and equipment used at the training center comes from Signal salvage dumps. Repairing of this equipment not only gives the student experience and material to work with, but cuts the cost of school operation considerably.

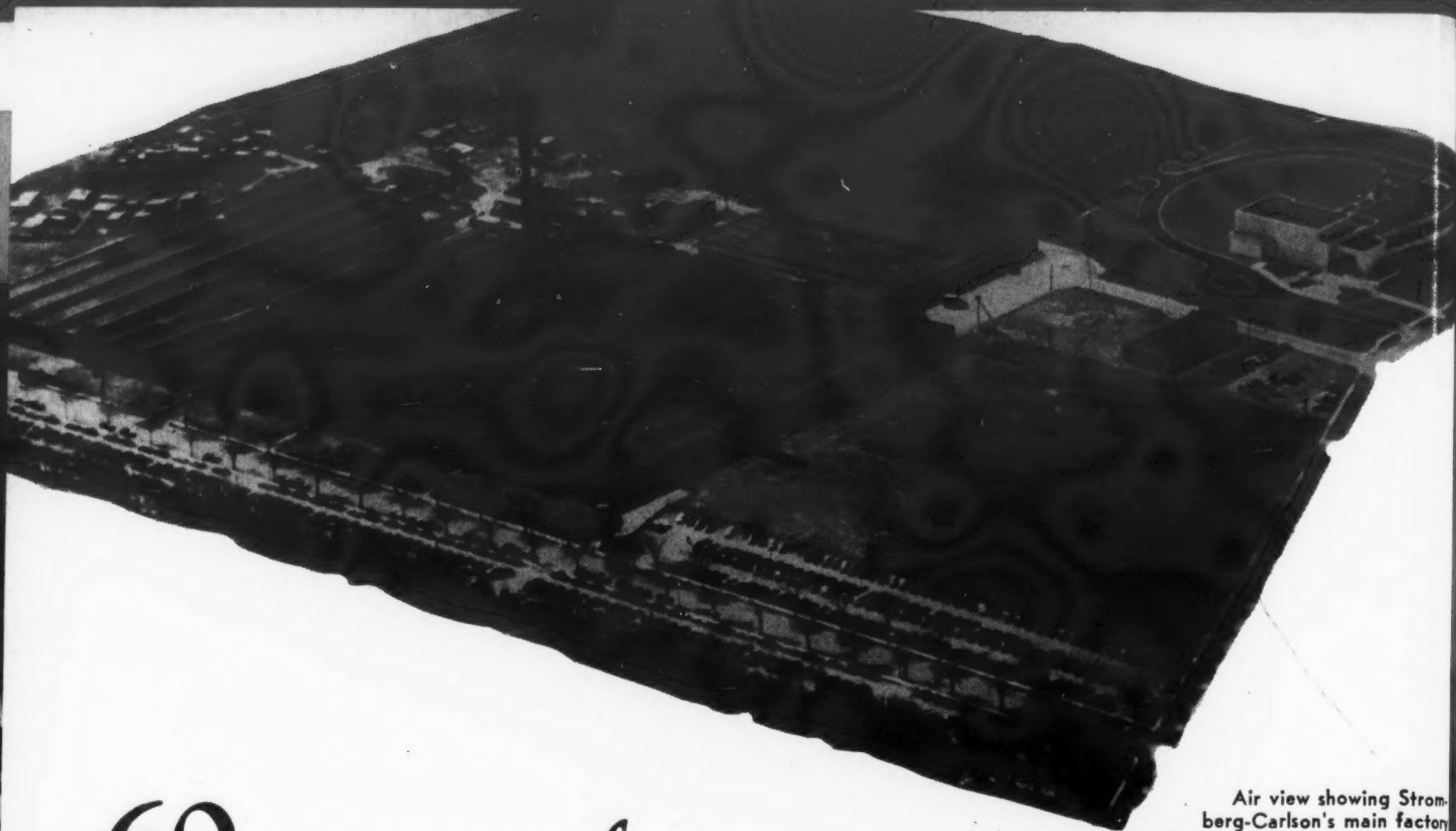
On-the-job training is offered to the student after he completes a required amount of book and classroom work. During the last week of training he is sent to school field units scattered throughout the surrounding area. Signal installations such as found in division, regimental, and battalion levels are simulated to give each student valuable field training in conditions similar to those encountered in actual units. Upon graduation, the majority of graduates are sent to front-line units fully prepared and tested for the rigors of combat.

Signal laboratories are non-existent at the school, primarily because U.S. Signal equipment is used throughout the ROK Army. Radio and wire communication units using voice transmission, found U.S. equipment readily adaptable to Korean use. Code and teletype transmission of the Korean language presented a problem. The written Korean language, a mixture of Korean and Chinese characters, was impossible to transmit. This led to the adoption of a 24-character phonetic alphabet, devised some 700 years ago. (At present, operators are being trained in experimental teletype and code systems, substituting English letters for Korean letters.)

Limited facilities of the school require signal units to conduct on-the-job training programs. Lesson plans are prepared by KMAG advisors in English and translated into Korean for student use. Beginning classes are usually instructed by KMAG advisors through the use of interpreters. Instructors are chosen from graduates and take charge of future classes after instructor training.

Courses such as cable-splicing, teletype, vehicle operation, and photography, taught in various signal battalions throughout South Korea, will ultimately be absorbed into the Signal School. An expansion program is underway to enlarge present facilities to handle a larger number of students and include courses taught in other units.

In summing up today's ROK Signal Corps, General Cho Eung Tyon, Chief of the ROK Signal Corps, stated: "Our signal training, which parallels that received by the American soldier, is the best. It is the type of training that has helped to make the Republic of Korea Army strong and enable our soldiers to assist in the rehabilitation of Korea."



Air view showing Stromberg-Carlson's main factory and office building, and new broadcasting headquarters "Rochester Radio City."

60 years of Progress at Stromberg-Carlson

by Stanley H. Manson

THE STORY OF STROMBERG-CARLSON parallels that of the great communications and electronics industries which have contributed so much over the years to better living for millions of people throughout the world. The continuing success and growth of this 60-year-old firm can also be attributed to a keen desire by its management to remain in its chosen field where experience and know-how have made its products famous for quality, durability and highly satisfactory service.

Today, Stromberg-Carlson is one of the acknowledged leaders in telephony, sound equipment and radio-television, and its products bearing the well-known slogan "There is Nothing Finer than a Stromberg-Carlson" are distributed broadly throughout the United States and all parts of the world.

Many success stories have been written in the fields of electronics and communications — some achieved overnight, others over a period of years. Stromberg-Carlson was founded in 1894 by two young Swedish

immigrants, Alfred Stromberg and Androv Carlson, who decided to manufacture a better telephone, following the expiration of the Alexander Graham Bell patents. Each had saved \$500.00 to launch the new business. Stromberg had previously worked for a well-known telephone manufacturer in Stockholm, and both he and his partner were employed by the Chicago Telephone Company when they decided to start their own enterprise.

In 1902, the improvements in their new telephone became evident to a progressive group of Rochesterians who induced them to move their business to Rochester, New York, and arrangements were made to build a large new factory on a 10-acre site. Having successfully established the business in this new location, Messrs. Stromberg and Carlson returned to Chicago in 1905 where Mr. Stromberg later financed and gave his name to a carburetor manufacturing business, and also a concern manufacturing electric time clocks and watchman's recording signal systems.

In 1909, Stromberg-Carlson strengthened its position in the telephone industry by acquiring a large part of the business of the American Electric Company of Chicago, and again in 1916 by taking over the telephone business of the Garford Manufacturing Company of Elyria, Ohio.

World War I found Stromberg-Carlson prepared to turn rapidly to all-out production of communications equipment for the government. This company supplied specially designed telephone sets for artillery observers and gun plotters, camp switchboards, combination field telephone and buzzer telegraph sets, as well as standard communications equipment for army camps and fortifications. Stromberg-Carlson telephones were installed in the palace of Versailles to carry all official reports of the peace conference to a waiting world. A quarter of a century later, this precedent was to be followed at the Nuremberg trials in Germany, and at the formal surrender of Japan aboard the U.S.S. Missouri, where Stromberg-Carlson's sound equipment was used to an-

ounce to crew members the step-by-step procedure of the historic capitulation.

Up to 1920 the company had been manufacturing telephones and switchboards exclusively. In that year the first signs of a great new industry began to appear when crystal radio sets came into vogue. A heavy demand for headsets, which the company had been manufacturing since 1915, plus jacks, plugs, cords, and similar products developed overnight. This promising new field of radio was investigated thoroughly, and in 1924, after a vast amount of research and experimentation, the first Stromberg-Carlson home radio receiver appeared on the market.

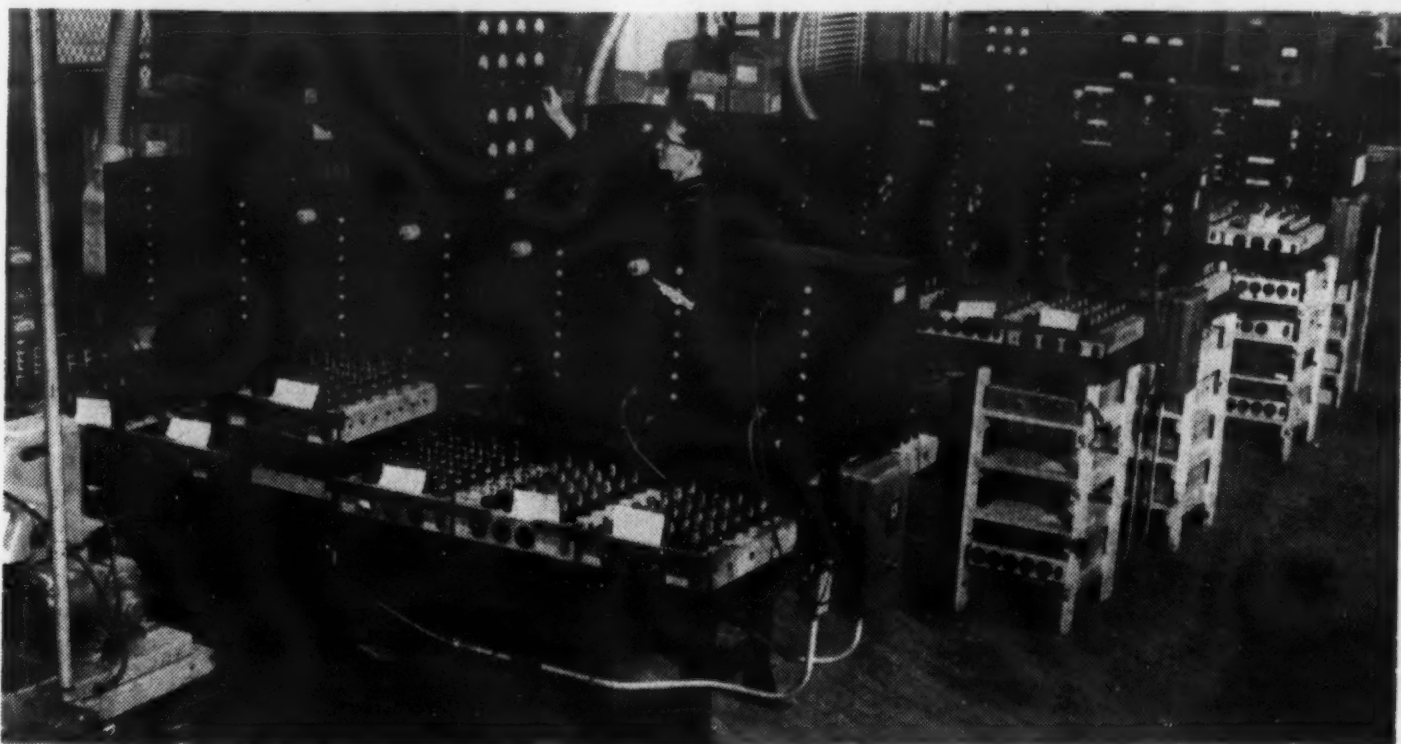
The majority of engineers in this country who designed the first radio receiving sets had been trained primarily in electric power transmission at a fixed single frequency and had no experience with materials and techniques for transmitting a broad range of speech and music frequencies, such as Stromberg-Carlson had gained from its telephone experience. At the start, these power engineers engaged by radio manufacturers made their audio transformers resonant to about 800 cycles in order to get high efficiency in a smaller space at low cost. Unfortunately, peaking voice and music frequencies or trying to compress them into a narrow band produced shrill and raucous reproduction in a radio receiver. Voices could be understood but did not sound natural. Music sounded high-pitched and sopranos were frequently ruled out of the programs by pioneer broadcasters. Long telephone experience prompted Stromberg-Carlson early in the 1920's to design an audio transformer which would handle a broad band of speech and music frequencies, and Stromberg-Carlson

headsets soon gave way to horn and cone type loud speakers. This was the beginning of the company's leadership in fine tone quality—a reputation it has enjoyed to the present day.

Stromberg-Carlson introduced many major improvements in broadcast receivers during the late 1920's, including total shielding of radio frequency stages, automatic volume control, visual tuning indicator, high-

added to telephone and switchboard production, caused Stromberg-Carlson to build new quarters in 1928 on a 48-acre plot of land, with its own private Carlson Road, where the headquarter offices and expanded factory facilities are located today.

In February 1927, Stromberg-Carlson purchased Rochester's pioneer local radio station, WHAM, which was operating at the Eastman



These vibrating tables, for pre-testing vacuum tubes, give equipment electronic and mechanical checks before assembly into completed civilian and Government products.

fidelity audio amplifiers and speakers, and other "firsts" in the field. As early as 1926, Stromberg-Carlson was the first manufacturer to provide a phonograph jack in the radio chassis, radio-type volume control and tone control for phonograph reproduction, and a magnetic pick-up kit which could be mounted in the old spring-wound phonographs, or one of the new electric motor-driven phonographs. Even before phonograph records were being recorded electrically, Stromberg-Carlson blazed the trail which led to the union of the radio and the modern record player.

The growth of its radio business,

School of Music of the University of Rochester on a power output of 100 watts. Today this clear channel 50,000 watt station is considered one of the country's most powerful and progressive AM broadcasting units.

In 1938, Stromberg-Carlson pioneered in the new development of frequency modulation (FM), and the following year was the first manufacturer to put a full line of FM receivers on the market. In 1939, the company began operating the first frequency modulation station in upstate New York, WHFM, a sister station to WHAM.

In early 1949, the first television tower in Rochester, New York, appeared on the horizon, from which Stromberg-Carlson's WHAM-TV began broadcasting the first television programs in this area in June of the same year. This Channel 5 100,000 watt station is now transmitting all NBC network color broadcasts, in addition to a full schedule of black and white programs from 7:00 A.M. until after midnight daily. All studio facilities for Stromberg-Carlson's three broadcasting stations are housed in a million dollar "Rochester Radio City" adjacent to the company's main plant. This large, modern building was opened to the public in February, 1948.



The first Stromberg-Carlson No. 1-A battery-operated radio receiver, manufactured in 1924.

Stromberg-Carlson's first television receivers appeared in the New York metropolitan market as early as 1939. This was the only section of the country where television programs were being broadcast at that time. Today, as television has spread across the country, Stromberg-Carlson remains in the forefront with a complete line of 21" and 24" black and white receivers. In April of this year, Stromberg-Carlson was the third television manufacturer to start assembly line production of color receivers on a limited basis. The radio-television division also produces a complete line of clock, portable, AC-DC table radios, and high-fidelity phonographs.

Stromberg-Carlson is one of the leading manufacturers of sound equipment for paging, inter-communications, or music distribution in industrial plants, schools, hotels, hospitals, airports, railroad stations and yards, ships and shipyards, warehouses, and amusement centers. The sound equipment division, with experience in this field since 1927, produces an extensive line of amplifiers, tuners, and many other components to meet all assembly requirements for large and small installations. It also manufactures and distributes high-fidelity components for home installations.

The production and distribution of electronic carillons for churches, schools, town halls, and cemeteries is another enterprise of the sound equipment division. Electronic amplification of the pure bell tone vibrations, produced by striking a few ounces of metal on metal, assures excellent quality. This results in compactness, ease of installation, and a tremendous saving in weight with great economy. Stromberg-Carlson carillon and bell installations range from a single note to three octaves or 38 bells. Automatic time controls and player rolls are also available.

In the field of telephone and switchboard equipment, Stromberg-Carlson is one of the best-known names—famous for pioneering leadership in the development of quality, trouble-free equipment. This company introduced the first self-contained (bell-in-the-base) handset in this country in 1931, the first dust-free dial in 1946, and the first completely water-proof telephone in 1949. Latest development is the "XY Switch" for dial exchanges. The prototype XY switch used in the XY dial system was developed in Europe. In 1944, Stromberg-Carlson obtained the exclusive rights to manufacture and sell the XY systems to telephone operating companies in the United States and Canada.

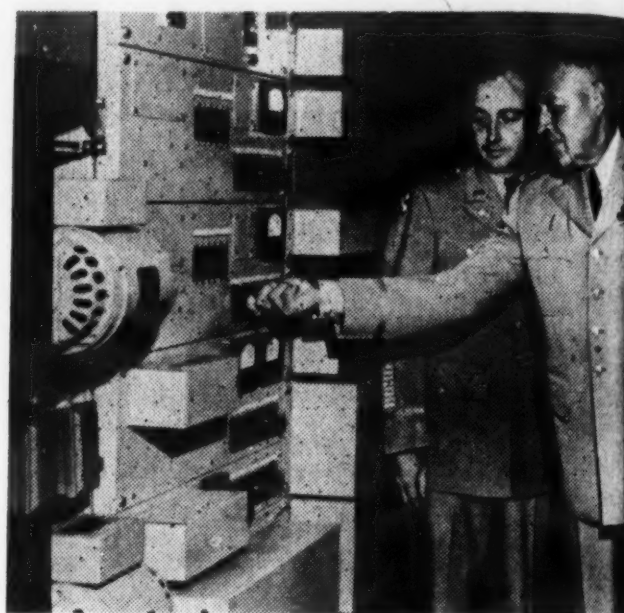
Beginning in 1945, Stromberg-Carlson assigned a group of telephone engineers to the job of determining that portion of the European system suitable for use in this country. Studies revealed that the switch, switch cell and multiple wire bank, all major components, were practicable.

To insure industry acceptance of the American version of the system, the standards were changed from metric to English measurements. Modifications in the design of the switch and its associated wire bank were necessary to insure a greater degree of reliability, as well as less costly manufacture. To make the American version of the system, complete new relays were designed that would meet the standards of relays manufactured in this country.

Basically the XY system manufactured by the Stromberg-Carlson Company is a step-by-step system, incorporating all of the principles of other such systems manufactured in this country but with added innovations. The XY switch, being a flat type unit, occupies considerably less space than other step-by-step switches, permit-

ting stacking of switch cells one above the other which, in turn, permits the use of continuous wire multiples. The multiple requires no soldered points between switches working into the same multiple. The XY switch, in its basic design, provides not only for tip, ring and sleeve but also the fourth wire, termed as the "help sleeve" and used to provide features not usually found in the ordinary step-by-step system. The switch is a 100-point unit and is used universally throughout the system as finders, selectors or connectors and is interchangeable.

The system provides a unique type of frequency marking for ringing, which is one of the major improvements in equipment of step-by-step



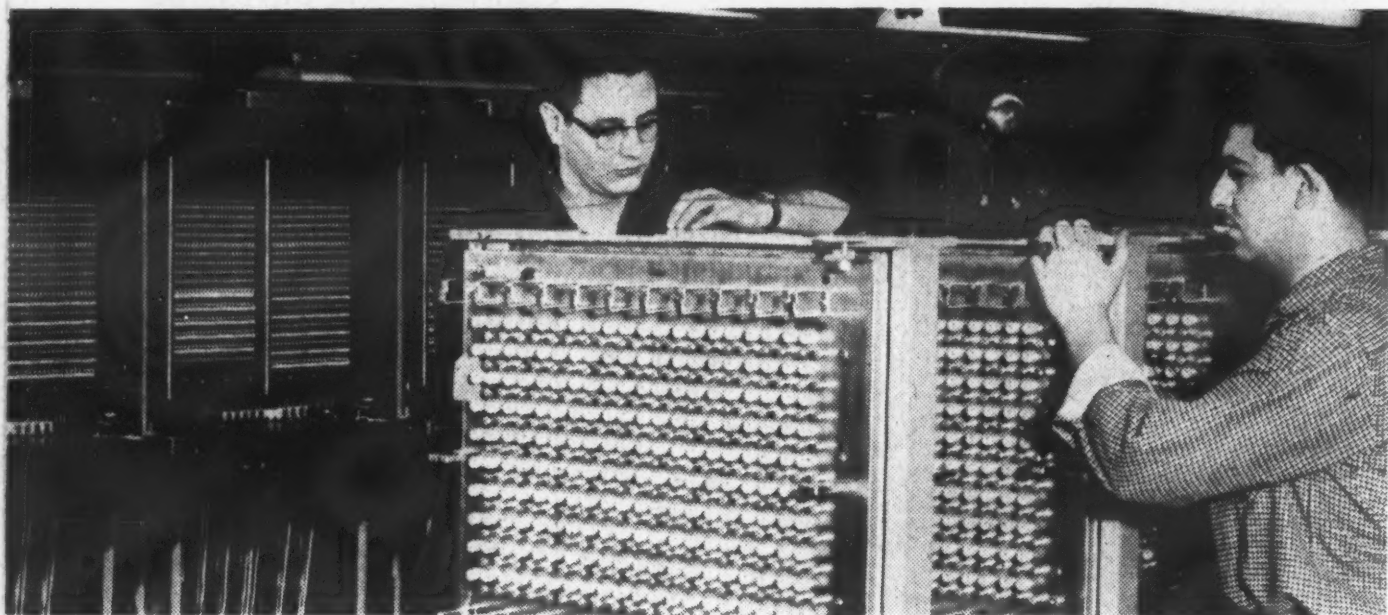
Major General George W. Read, Jr., commanding general, Fort Knox, throws the main switch to place in operation a new Stromberg-Carlson XY telephone system at Fort Knox.

design. Double contacts are used throughout. Switch wipers are indestructible and will last the lifetime of the switch. Stromberg-Carlson's design of the system using plug-in circuit plates, switches, etc., makes it the most flexible on the market today. Back to back mounting of the equipment on the framework again proves to be a space saver. In comparable Central Office sizes the XY system requires from 15% to 25% less floor space, resulting in appreciable building cost savings.

The Army Signal Corps has purchased from Stromberg-Carlson approximately 50,000 lines of XY equipment within the last two years. 5,000 lines have been installed at Fort Monmouth; 5,000 lines at Fort Knox and an installation of 4,000 lines is presently being made at Fort Sam Houston. Other installations not mentioned have been made or are contemplated.

Many of the 5,300 independent telephone companies in America today, operating 12,000 exchanges and more

Engineers test AN/TTC-7 Government switchboard equipment just off the assembly line.



than 8,000,000 telephones, have evidenced increased interest in the modernly-designed Stromberg-Carlson XY systems. The fact that 700 of these independent telephone companies have already purchased XY systems for more than 1,000 installations within the last five years indicates nationwide acceptance.

The telephone division has also developed toll ticketing equipment to provide subscriber toll dialing on a mechanical electronic basis, using specialized computer equipment to tabulate and record time and rate data on each long distance call. The heart of this system is a unique XY recorder mechanism employing an endless belt of magnetic tape.

Employees at Stromberg-Carlson are particularly proud of the company's World War II record of achievement as one of the 12 largest producers of electronic equipment for the armed services. Pearl Harbor and the fast-moving days that followed brought a complete halt to civilian radio and telephone production. This world conflict brought Stromberg-Carlson tremendous responsibilities as a major producer of communications equipment for the Signal Corps, Air Corps and the Navy. This included aircraft, radio, radar, telephone, sound, and battle-announcing equipment. The excellence of this output, both in quality and quantity, was officially recognized by the Army and Navy five times during World War II with awards of additional stars on the company's Army-Navy "E" production flag.

Today, in the government's great defense program for world peace, nearly half of the plant facilities and manpower are devoted to the production of equipment for the armed services by various divisions of the company.

The spirit and abilities of the 5,000 employees at Stromberg-Carlson are far above average, thanks to the availability of skilled help in the Rochester area, and the company's general working conditions and facilities. The great diversity in the company's products and their technical nature requires an unusually high level of skill. This is best illustrated by the relative number of engineers, technicians, draftsmen, and designers included in the total company personnel. Approximately 400 experienced engineers and their staffs are developing new ideas and products for future civilian and government requirements in the Electronics Engineering Department, Research Laboratory, Sound Systems Engineering



A telephone repairman works on the recently installed XY central office system at Fort Monmouth.

Department, Telephone Engineering Department, Radio-Television Engineering Department, Physical Test Laboratory, Materials Laboratory, Instrument Laboratory, and the Stromberg-Carlson Electronic and Environmental Test Center Building, located on an isolated hill some 12 miles from Rochester.

Credit for the great strides made by Stromberg-Carlson during the past five years is due Robert C. Tait, who was brought back to his native Rochester by the Board of Directors to become president of the company in April, 1949, following his impressive background of business and financial experience as vice president of the Mellon National Bank in Pittsburgh. Given the full responsibility for management by the directors, he immediately instilled a new spirit in the entire organization by establishing the present four-division setup, namely, radio-television, telephone, sound equipment, and broadcasting, placing each division on its own feet

Robert C. Tait, president of Stromberg-Carlson Company.



under capable general managers and their staffs of experienced personnel. Only finance, public relations, industrial relations, and maintenance remain general in scope.

Shortly after joining the company, Mr. Tait investigated the Scanlon Plan for employee bonuses and incentives, and following considerable study and many conferences with the plan's originator, Joseph Scanlon, Professor of Industrial Psychology at the Massachusetts Institute of Technology (MIT), he presented the plan to the employees at Stromberg-Carlson and they accepted it enthusiastically. In 1953, Stromberg-Carlson employees received \$1,127,204 in Scanlon Plan bonuses.

Another major project was the organization of the Stromberg-Carlson Credit Corp., a subsidiary to help finance independent telephone companies. Many of the smaller independent telephone companies in the United States lack the borrowing power to finance capital outlays for new equipment. This subsidiary with a line of credit now amounting to \$7,000,000 provides a much needed service to the customers of the company's telephone division. It has helped to substantially increase the volume of telephone business since its inception.

Stromberg-Carlson is in a healthy financial position today, which allows for present and future planned expansion. The company recently acquired the Southern Electric and Transmission Company of Dallas, Texas, which now operates as the SETCO Division of Stromberg-Carlson. This division manufactures electronic wire carrier equipment for the independent telephone industry and for gas and oil pipe lines. In 1953, the company also augmented its research services by an affiliation

(Continued on page 56, col. 1)

Association Affairs

HISTORIC DIRECTORS' MEETING CHANGES NAME OF ASSOCIATION *Regional Vice Presidents and Convention on Agenda*

Twenty-one directors of the AFCA met in New York City on October 29th for the first mid-season directors' meeting ever held by the AFCA.

The highlight of the meeting was the unanimous decision to change the name of the association to the Armed Forces Communications and Electronics Association. This vote followed a chapter poll which was overwhelmingly in favor of the change.

Due to the necessary legal and administrative steps involved, the change will not be effective until about the first of the year.

At this meeting, it was also decided to establish six regional vice presidents in place of the Regional Advisory Committee which now exists. These vice presidents are to be appointed by the national president for an indefinite period. The present regional advisory committee members have been appointed regional vice presidents, with the following excep-

tions: George C. Ruehl, Jr., now Region B vice president, and Col. George L. Richon, Region D.

Plans for the 9th Annual AFCA Convention were discussed in detail. It was announced that this convention will include industry exhibits, as well as the Service exhibits which have always been a part of AFCA conventions.

The Signal Corps is making plans for an outstanding program at Fort Monmouth on May 21, the last day of the Convention. On this day, Fort Monmouth will celebrate Armed Forces Day, postponing it for AFCA's benefit.

Other items of business included lowering the number of members necessary for a chapter's chartering from 25 to 15, and the establishment of a foreign associate group membership category to be handled in the same manner as foreign associate individual members.

NEW REGIONAL VICE PRESIDENT

George C. Ruehl, Jr., has been appointed AFCA Regional Vice President to represent Region B which covers Delaware, D. C., Kentucky, Maryland, Ohio, Pennsylvania, West Virginia and Virginia. The chapters in this area are Baltimore, Cleveland, Dayton-Wright, Kentucky, Peninsula, Philadelphia, Pittsburgh and Washington.

Mr. Ruehl brings considerable experience in chapter affairs to this new assignment. Active in the administration of the Baltimore Chapter for many years, he served as its president from June 1952 to June 1954, and under his leadership the chapter won the 1953-54 Chapter of the Year title. He is now chairman of the chapter's board of directors.

Emmett R. Shute Retires From Western Union

Emmett R. Shute, vice president in charge of operation for the Western Union Telegraph Company, has retired after more than 42 years in Western Union's General Office.

Mr. Shute has long been an active member of the AFCA and is now serving as Vice President of the New York Chapter.

Combining the background of a graduate engineer with practical telegraph experience, he pioneered in many of Western Union's outstanding technical advances and particularly in the development of executive personnel of similar background and experience.

During World War II, Mr. Shute was chief liaison officer between Western Union and the Armed Services with the rank of Lieutenant Colonel in the Signal Corps, and Chairman of the Telegraph Committee of the Board of War Communications.

Mr. Shute has recently been elected president and managing officer of the Serial Federal Savings and Loan Association of New York City.

Sperry Names AFCA Members to Key Positions

Appointments of AFCA members to four key positions in the Federal Department of the Sperry Gyroscope Company were announced recently.

George R. Lawrence, former manager for U. S. Army contracts, was named manager, Air Force Department.

Thomas W. Melia, former manager for spare parts, was named manager, Army Department, to succeed Mr. Lawrence.

Franklin H. Joseph, former USAF production representative, was appointed to the new position of policy and planning supervisor.

Gerald B. Wright was appointed assistant manager for research and development in the Air Force Department.

Dr. Engstrom Elected to RCA Board of Directors

Election of Dr. Elmer W. Engstrom as a member of the Board of Directors of the Radio Corporation of America has been recently announced by Chairman of the Board, Brig. Gen. David Sarnoff. Dr. Engstrom, is RCA Executive Vice President for Research and Engineering.

First as an engineer and then as a research administrator, Dr. Engstrom has had a pioneering role in the development of radio, sound motion picture apparatus, the general science of electronics, and both black-and-white and color television.

AFCA Members Named to Advisory Group on Electronic Parts

Julian K. Sprague, president of the Sprague Electric Company of North Adams, Massachusetts, has been named Chairman of the Advisory Group on Electronic Parts of the Department of Defense.


Serving with Mr. Sprague on the 5-man group will be three members of the AFCA: Leslie J. Woods, vice president in charge of engineering of the Philco Corporation; Estill I. Green, director of transmission apparatus development at Bell Telephone Laboratories, Inc., and A. W. Rogers of the Squier Signal Laboratory at Fort Monmouth, New Jersey.

Also serving on the advisory group are Edward Mroz of the Electronics Division of the U. S. Navy Bureau of Ships, and Amos Petit of the U. S. Air Force Wright Development Center at Dayton, Ohio.

GEN. WILLIS JOINS HALLICRAFTERS

Brig. Gen. James S. Willis, U. S. Army, retired, a long-time member of the Armed Forces Communications Association, has joined The Hallcrafters Company of Chicago as coordinator of research and development.

(Continued on page 36)



It was natural for Lewyt to be brought into the radar picture when, in 1942, radar became a vital part of our war effort . . . because Lewyt is amazingly versatile!

Lewyt has been producing electronic equipment of all types for the Military since World War I.

And since joining the radar effort, Lewyt has engineered and produced everything from giant "bedspring" antennas to miniaturized airborne IFF equipment.

RADAR ...another example of LEWYT versatility!

... Lewyt-engineered early-warning equipment was among the first to serve in the Pacific

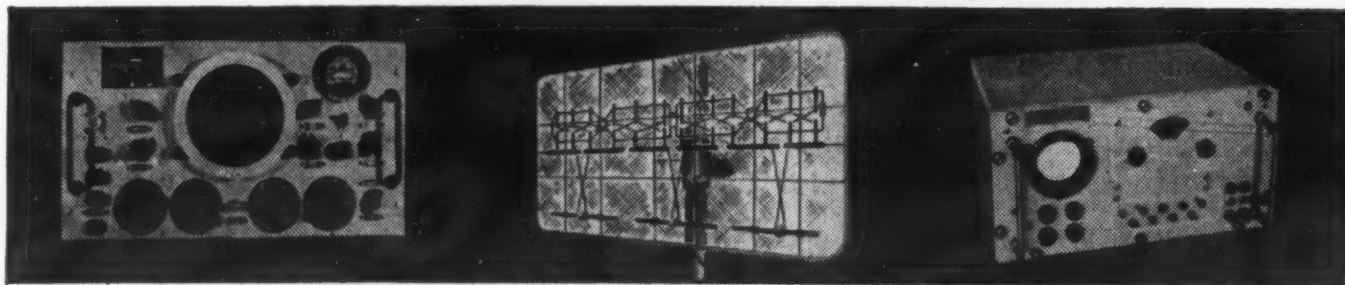
... Lewyt-built radar gear homed our first guided missiles on their targets

... Lewyt test equipment still monitors and maintains radar systems throughout the world

... And today, Lewyt is engaged in the development and production of highly classified equipment for America's defense.

Radar is another example of the versatility which enables Lewyt to "fill the bill" when called on to design and produce equipment utilizing the techniques demanded by modern electronic advances.

In addition to being a Government Contractor, Lewyt is also one of the country's largest vacuum cleaner manufacturers. Thus, Lewyt is able to keep 1,800 trained workers on its production lines at all times—producing for peace, geared for emergencies.



Radar Monitoring Equipment

"Bedspring" Radar Search Antennas

(TS-452) Signal Generator

LEWYT

Manufacturer of Electronic and Electro-Mechanical Equipment Since 1888

LEWYT MANUFACTURING CORPORATION
Brooklyn 11, New York

ASSOCIATION AFFAIRS

Before joining Hallicrafters, General Willis was commanding general of the Signal Corps Supply Agency at Philadelphia.

AFCA MEMBERS IN SIGNAL CORPS NEWS

SIGNAL CORPS GIVES NEW STARS TO EIGHT

President Dwight D. Eisenhower, in a series of recess appointments, has announced the promotion of a Signal Corps brigadier general to the temporary rank of major general and the promotion of seven Signal Corps colonels to the temporary rank of brigadier general.

The newly appointed major general is Victor A. Conrad, Commanding General of Fort Monmouth. General Conrad received news of his promotion at a special ceremony called by Chief Signal Officer, Major General George I. Back, visiting Fort Monmouth for the dedication of the new \$22,000,000 Signal Corps Engineering Laboratory.

Those officers named to the temporary rank of brigadier general are: William L. Bayer, Commanding Officer, Signal Corps Supply Agency, Philadelphia, Pa.; William P. Pence, Signal Officer, 7th Army, U. S. Army, Europe; Albert F. Cassevant, Signal Officer, Army Forces Far East; Francis F. Uhrhane, Commanding Officer, Signal Corps Engineering Laboratories, Fort Monmouth, N. J.; and the following who are division chiefs in the Office of the Chief Signal Officer, The Pentagon, Washington, D. C.: Walter B. Larew, Chief, Army Communications Service Division; James Dreyfus, Chief, Personnel and Training Division; and Herbert L. Scofield, Chief, Procurement and Distribution Division.

New Research & Development Chief for Signal Corps

Former Bell Labs Scientist

Edward L. Nelson, Technical Director of the Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey, has recently been appointed Scientific Chief of Research and Development for the Signal Corps.

In his new assignment, Mr. Nelson will be responsible to the Chief Signal Officer, Major General George I. Back, for the technical direction of the research and development mission



Maj. Gen. James D. O'Connell, Deputy Chief Signal Officer (l) and Maj. Gen. George I. Back, Chief Signal Officer (r) pin new stars on recently promoted Maj. Gen. Victor A. Conrad, Commanding General of Fort Monmouth, New Jersey.

of the Army Signal Corps, which includes highly specialized and exceptionally complex scientific and engineering programs in electronics, applied physics, meteorology, photography and many other allied fields.

Prior to his appointment as Technical Director of the Signal Corps Engineering Laboratories in 1951, Mr. Nelson was with the Bell Telephone Laboratories in New York, engaged in the development and design of military weapons systems and equipment under Army and Navy contracts.

Mr. Nelson is a member of the Fort Monmouth Chapter of the AFCA.

Storbraaten Retires as CO of Sacramento, Welsh Succeeds Him

A review and retreat ceremony was held September 30 at the Sacramento Signal Depot, Sacramento, Calif., for Colonel Sidney N. Storbraaten, commanding officer of the installation since 1952 and an active AFCA member, who retires from the Army after 34 years of service.

He has been succeeded by Colonel Stuart M. Welsh, who, prior to this assignment, was at the Signal Corps Supply Agency in Philadelphia.

Before coming to Sacramento Colonel Storbraaten was deputy chief and chief of special projects division, Production and Requirements Directorate, Munitions Board, in the office of the Secretary of Defense.

Colonel Welsh's previous assignments include: chief, production control division, Signal Corps Procurement District in Philadelphia, deputy signal officer with 8th Army in Korea and chief of the accounting division at the Signal Corps Supply Agency in Philadelphia.

NEW POST FOR GENERAL COLLINS

Brig. Gen. Samuel P. Collins has assumed command of the Army Signal Corps Training Center, Camp Gordon, Georgia, succeeding Brig. Gen. T. J. Tully who retired recently.

General Collins, a member of the AFCA since 1947, was instrumental in reorganizing and developing the Military Amateur Radio System (MARS).

His earlier assignments included Chief, Signal Section, Air Service Command at Wright Field, Chief of the Communications Control Group, Military Intelligence Service, G-2, and Deputy Director (Army) Armed Forces Security Agency.

Immediately preceding his assignment to Camp Gordon, General Collins served as Chief of the Personnel and Training Division, Office of the Chief Signal Office, Washington, D.C.

H. G. Evers Succeeds H. P. Boswau as Leich Chief Engineer

Hans P. Boswau retired on October 31 as vice-president and chief engineer of the Leich Electric Company. Mr. Boswau, the inventor of the Leich Dial System, will continue his development work for Leich in a consulting capacity.

Harry G. Evers, formerly assistant chief engineer, has been appointed to succeed Mr. Boswau. Mr. Evers, who has been with Leich since 1949, is a veteran of over twenty-five years in the independent telephone field, and is recognized as one of the outstanding circuit engineers in the communications industry. Before joining Leich, he was associated with the Federal Telephone and Radio Corp.



package

This story is wrapped up in seven packing cases. They contain the seven sections of the USAF B-61 Martin Matador pilotless bomber.

It is the story of one of the most tradition-shattering pieces of hardware in this world . . . a zero-launch pilotless bomber that can be deployed to any spot on earth—without having ever been previously assembled—and with total interchangeability of parts.

To realize fully the importance of this package job, you should know these things:

...The Matador meets performance requirements more exacting than those of a fighter plane.

...Its instrumentation section alone is one of the most functional single packages ever developed.

...It is built by new Martin-developed processes that are causing basic changes in industry concepts and production methods.

...And it is being delivered at the lowest known cost-per-pound of any military aircraft in production today.

You will hear more about Martin!

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AFCA CHAPTERS

National Director of Chapters: Maj. Gen. Gordon A. Blake, USAF

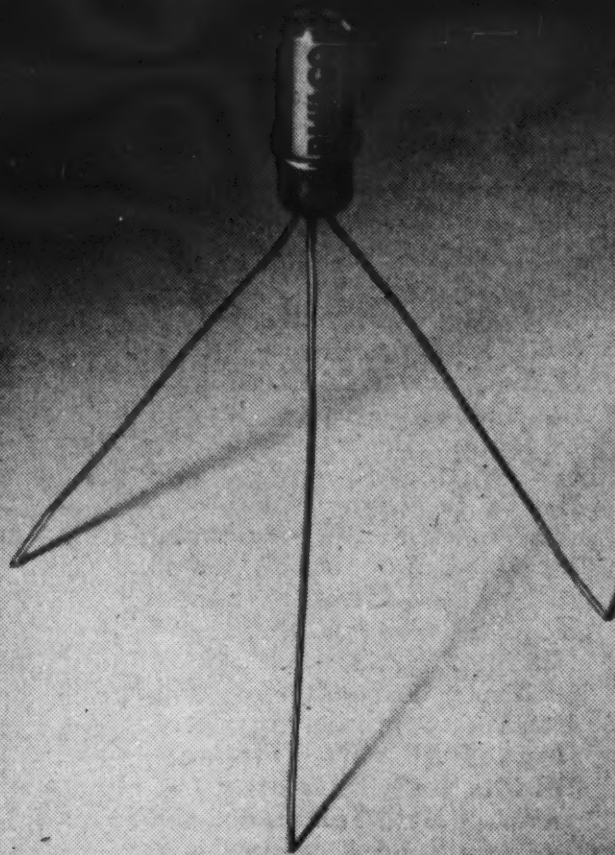
REGIONAL VICE PRESIDENTS

- Region A:** T. L. Bartlett, RCA, 30 Rockefeller Plaza, New York, N. Y. *New England States, New York, New Jersey.*
- Region B:** George C. Ruehl, Jr., 2118 St. Paul St., Baltimore, Md. *Delaware, District of Columbia, Kentucky, Ohio, Pennsylvania, West Virginia and Virginia.*
- Region C:** Ralph S. Grist, So. Bell T&T Co., Atlanta, Ga. *Southeastern States along Atlantic and Gulf coasts — from North Carolina to Louisiana including Tennessee.*
- Region D:** Col. George L. Richon, Hq. Fourth Army, Fort Sam Houston, Tex. *New Mexico, Texas, Oklahoma, Arkansas.*
- Region E:** T. S. Gary, 1033 W. Van Buren St., Chicago, Ill. *Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, North Dakota, South Dakota, Wyoming, Colorado.*
- Region F:** Col. Lloyd C. Parsons, 1807 16th Ave., San Francisco, Calif. *Arizona, Utah, Nevada, California, Idaho, Oregon, Montana and Washington.*

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- ATLANTA:** President—W. K. Mosley, Southern Bell T&T Co., 805 Peachtree St. N.E., Atlanta, Ga. Secretary—R. L. Janss, Southern Bell T&T Co., 900 Peachtree St., N.E., Atlanta, Ga.
- AUGUSTA-CAMP GORDON:** President—W. O. McDowell, Southern Bell T&T Co., 937 Greene St., Augusta, Ga. Secretary—James M. Williams, Southern Bell T&T Co., 937 Greene St., Augusta, Ga.
- BALTIMORE:** President—Donald C. Lee, Westinghouse Electric Corp., 2519 Wilkins Ave., Baltimore, Md. Secretary—Karl H. Keller, 2519 Wilkins Ave., Baltimore, Md.
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- CAYUGA:** President—Donald T. Olmstead, GE Advanced Electronics Center, Cornell University, Ithaca, N. Y. Secretary—R. O. McCary, GE Advanced Electronics Center.
- CHICAGO:** President—Fritz Franke, Hallicrafters Co., 4401 W. Fifth St., Chicago, Ill. Secretary—Henry J. McDonald, Kellogg Switchboard & Supply Co., 6650 So. Cicero St., Chicago, Ill.
- CLEVELAND:** President—Al Gross, 11462 Euclid Ave., Cleveland, Ohio. Secretary—T. F. Peterson, 1434 Union Commerce Bldg., Cleveland, Ohio.
- DAYTON-WRIGHT:** President—Roy L. Merwin, Jr., General Electric Co., 410 W. First St., Dayton, Ohio. Secretary—M. Jane Hurley, GE, 410 W. First St., Dayton.
- DECATUR:** President—Col. Frank J. Schaal, Decatur Signal Depot, Decatur, Ill. Secretary—David W. Richardson, 1075 West King, Decatur, Ill.
- EUROPEAN:** Inactive.
- FAR EAST:** President—Capt. F. C. B. Jordan, USN, COMNAVFE, N-5 FPO, S.F.
- FORT MONMOUTH:** President—Col. Paul O. Langguth, SCEL, Fort Monmouth, N. J. Secretary—Felix Celli, SCEL, Fort Monmouth, N. J.
- GENEVA (Sub-Chapter of Paris):** President—John H. Gayer, International Frequency Registration Board, Palais Wilson, Geneva. Secretary—Gerald C. Gross, Int'l Telecommunications Union, Geneva.
- GULF COAST:** President—James C. Dabney, Southern Bell T&T Co., Gulfport, Miss. Secretary—Rodney M. Van Loon, 20 Peters Ave., Biloxi, Miss.
- GREATER DETROIT:** President—Paul J. Schafer, 5656 Hillcrest, Detroit, Mich. Secretary—J. R. Saxton, Michigan Bell Telephone Co., 305 Michigan Ave., Detroit, Mich.
- HAWAII:** President—Capt. Richard E. Elliott, USN, DCO, Navy 128, S. F. Secretary—Lt. Cdr. Charles E. Ross, 148 Kaukama St., Lanikai, Oahu, T.H.
- KANSAS CITY:** President—Carleton L. Buell, Western Union, 114 E. 7th St., Kansas City, Mo. Secretary—E. L. Parkington, Western Union, 114 E. 7th St., Kansas City.
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- LONDON:** President—Cornelius G. Mayer, 55 Pall Mall, London S.W. 1. Secretary—Maj. George E. Marak, Office of Air Attache, FPO 100, Box 36, N. Y.
- LOUISIANA:** President—C. C. Walther, 714 Howard Ave., New Orleans, La. Secretary—A. Bruce Hay, Southern Bell Tel & Tel Co., 520 Baronne St., New Orleans, La.
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- PARIS:** President—Arian H. de Goede, 79 Avenue des Champs Elysees, Paris 8, France. Secretary—Lt. Col. Andrew J. Burch, SigDiv, SHAPE, APO 55, N. Y.
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- RIO:** President—Herbert H. Schenck, Caixa Postal 709, Rio de Janeiro, Brazil.
- ROCHESTER:** President—John Whittle, Eastman Kodak Co., 343 State St., Rochester, N. Y.
- SACRAMENTO:** Inactive.
- SAN FRANCISCO:** President—Col. Lloyd C. Parsons, 1807 - 16th Ave., San Francisco, Calif. Secretary—William R. Patton, 965 Chestnut St., San Carlos, Calif.
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AFCA Group Members

Communications—Electronics—Photography

Listed below are the firms who are group members of the Armed Forces Communications Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

Acme Teletronix
Admiral Corporation
Air Associates, Inc.*
Aircraft Radio Corp.
Allied Control Co., Inc.
Allied Radio Corporation
Almo Radio Company
American Cable & Radio Corp.
American Institute of Electrical Engineers
American Machine & Foundry Co.
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Anaconda Wire & Cable Company
A. R. F. Products, Inc.
Argus Cameras, Inc.
Arnold Engineering Company
Atlas Precision Products Co.
Audio Products Corporation
Automatic Electric Company
Automatic Electric Sales Corp.
Automatic Telephone & Electric Co., Ltd.
Baltimore News Post
Barry Corporation, The
Bell Telephone Company of Pa.
Bell Telephone Laboratories, Inc.
Bendix Radio
Berkshire Transformer Corp.
Bliley Electric Company
Breeze Corporations, Inc.
Burnell & Company
California Water & Telephone Co.
Cambridge Thermionic Corp.
Capehart-Farnsworth Co.
Capitol Radio Engineering Inst., Inc.
Cargo Packers Inc.
Carolina Telephone & Telegraph Co.
Central Technical Institute
Chesapeake & Potomac Tel. Co.
Churchill Cabinet Co.
Cincinnati & Suburban Bell Tel. Co.
Collins Radio Company
Columbus Process Co., Inc.
Copperweld Steel Company
Cornell-Dubilier Electric Corp.
Crosley Division-Avco Mfg. Corp.
Dana, P. A., Inc.
Designers for Industry, Inc.
De Vry Corporation
Diamond State Telephone Co.
Downing Crystal Company
Dukane Corporation
DuMont, Allen B., Laboratories, Inc.
Eastman Kodak Company
Electronic Associates, Inc.
Elgin Metalformers Corporation
Espey Manufacturing Co., Inc.
Federal Telecommunication Laboratories*
Federal Mfg. and Engineering Corp.
Federal Telephone & Radio Corp.
General Aniline & Film Corp.
General Cable Corporation

General Communications Co.
General Electric Company
General Telephone Corp.
General Transformer Co.
Gilfillan Bros., Inc.
Globe Wireless, Ltd.
Gray Manufacturing Co.
Guardian Electric Mfg. Co.
Hallicrafters Company, The
Haloid Company
Hammarlund Manufacturing Co., The
Hazeltime Electronics Corp.
Heinemann Electric Company
Hercules Motor Corp.
Hitemp Wires, Inc.
Hoffman Laboratories Incorp.
Hopkins Engineering Co.
Hughes Aircraft Company
Illinois Bell Telephone Co.
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International Business Machines
International Resistance Co.
International Tel. & Tel. Corp.
Jacobsen Manufacturing Co.
Jansky & Bailey, Inc.
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Keystone Electronics Co.
Kleinschmidt Laboratories, Inc.
Lavoie Laboratories
Leich Sales Corporation
Lenz Electric Manufacturing Co.
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Librascope, Inc.*
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Magnavox Company
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Merit Coil and Transformer Corp.
Michigan Bell Telephone Company
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Muter Company, The
Mycalex Corporation of America*
National Company, Inc.
Nelson Technical Enterprises
New England Tel. & Tel. Co.
New Jersey Bell Telephone Company
New London Instrument Co.
New York Telephone Company
Northwestern Bell Telephone Co.
Oak Manufacturing Co.
Ohio Bell Telephone Co.
O'Keefe & Merritt Company
Otis Elevator Co., Electronic Division
Pacific Mercury Television Mfg. Corp.
Pacific Telephone & Telegraph Co.
Phebeo, Inc.
Philco Corporation
Photographic Society of America
Pickering & Company, Inc.
Precision Apparatus Co., Inc.
Plessey Company, Ltd., The*
Prodelin Inc.
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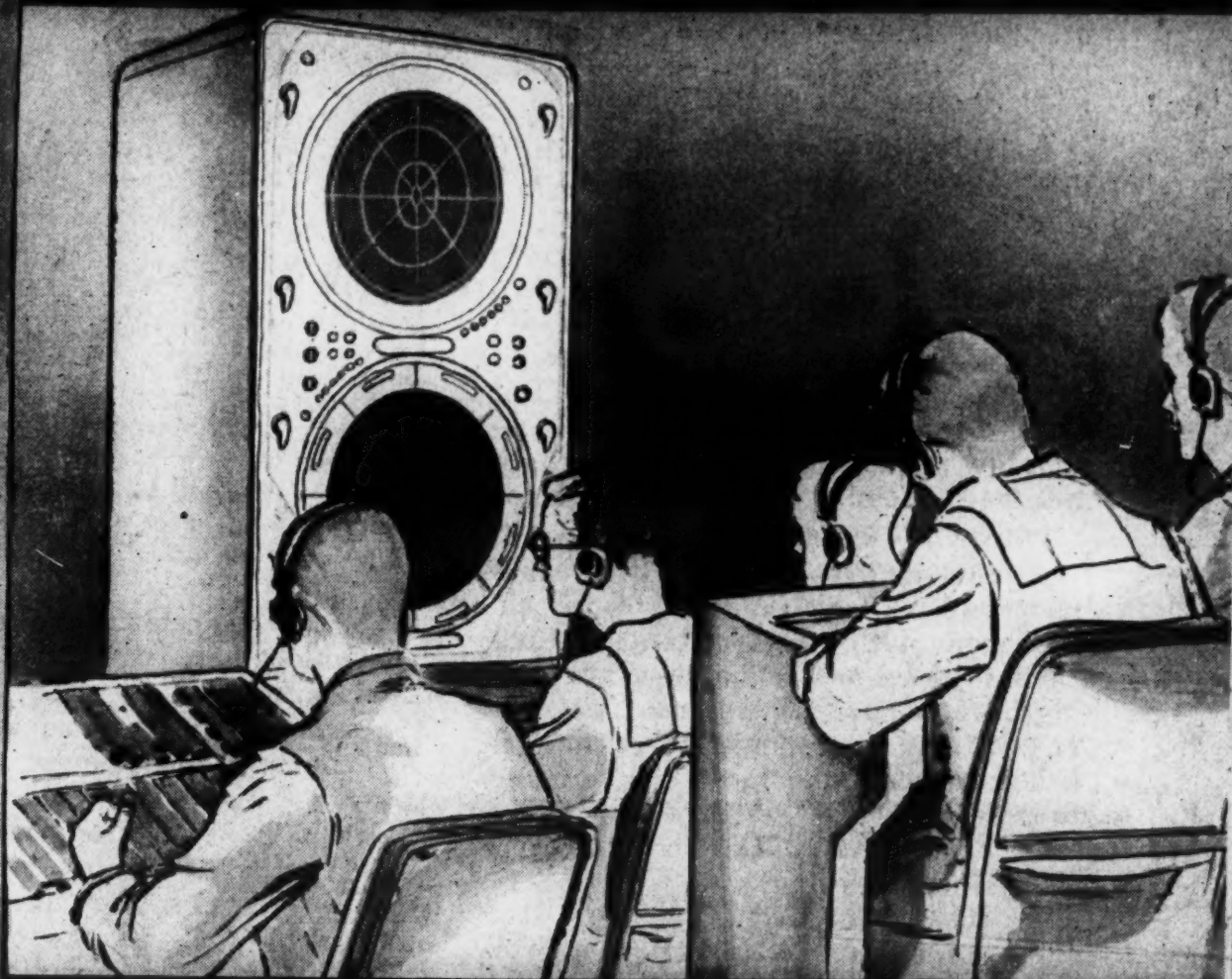
Radio Condenser Company
Radio Corporation of America
Radio Engineering Laboratories Corp.
Radio Frequency Laboratories, Inc.
RCA Photophone, Ltd.
RCA Victor Division
Radio Receptor Company
Raymond Rosen Engineering Products, Inc.
Ray-O-Vac Company
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Bendix Aviation Corp.
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Remington Rand, Inc.
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Pilot International Corp.
Saxonburg Ceramics
Seeburg, J. B. Corporation
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Stanford Research Institute
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In a matter of seconds these on-coming enemy blips will be marked for destruction.

When the Navy's new Mark 6 Target Designation System sights an enemy, the range and bearing data are automatically transmitted to appropriate gun directors. Guns are "on target" before the flying object gets within maximum effective range. The result may well spell the difference between survival and disaster to ship and crew.



Developed by RCA in close coordination with Naval personnel, the Mark 6 Target Designation System is now in full production. It is but one of the many complete electronic systems which RCA has developed for the armed forces. RCA engineering—from original planning to final production—assures greater efficiency, effectiveness and safety in operation.



GOVERNMENT DEPARTMENT
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DIVISION CAMDEN, N. J.

Chapter News

1954 Chapter of the Year—Baltimore

Atlanta

More than 150 members met on September 22nd at the Fort McPherson officers' club for the chapter's first meeting of the fall season. Principal speaker was Col. George Dixon, AFCA Executive Vice President, who reported to the membership on the overall growth and activity of the association.

Also featured on the program was the NBC kinescope of the tactical television demonstration held at Fort Meade on August 11th. Shown in the area for the first time, the film was a vivid portrayal of the Army's "command post of the future" which will enable the combat commander to see and influence the course of battle. The film also demonstrated the practicability of future military television communications between a theater of operations and headquarters in Washington.

A performance by the Third Army entertainment group concluded the evening's activities.

Augusta-Camp Gordon

Civil defense was the subject of the chapter's August 19th meeting, with Mrs. G. W. Freiberg, Director of Civil Defense for the Augusta area, highlighting its activities and responsibilities and stressing the great need for volunteer workers.

A letter addressed to all AFCA chapter presidents from Col. Percy G. Black, chairman of the AFCA National Civil Defense Advisory Committee, concerning civil defense aid was read and discussed, and a committee was established to serve the local civil defense organization in the communications field. Chairman of the committee is Col. George Lennox, with Pryor K. Jones as vice-chairman. Members are: Lt. Col. Moore, Lt. Col. S. S. Furse, W. B. Neeley, and Francis A. Saxon who is also chief of communications for Augusta Civil Defense.

Colonel Dixon addressed the chapter on September 23rd, the day following his visit to Atlanta. He also brought with him the NBC kinescope which had been loaned for the chapter programs by the Chief Signal Officer.

The dinner-meeting and social hour which preceded it was held at Timmerman's restaurant in Augusta. Brig. Gen. S. P. Collins, new commanding officer of the Signal Corps Training Center, and a long time member of the AFCA, was introduced and welcomed into the chapter.

Baltimore

The Maryland Drydock Company was host to Baltimore Chapter members and

guests at its Fairfield yard on September 21st.

The evening's activities began with a tour of the yard and covered the following facilities: the electrical shop where ship motors are balanced; the machine shop where ship generators are rebuilt or reconditioned and tested, etc.; the paint shop, and the fabricating and carpenter shops.

Another stop on the tour was the drydock which can handle a 600-foot ship and is equipped with a tower crane which can handle 35 tons. Of special interest was the 608-foot heavy cruiser, the USS WICHITA, which had been brought to the yard from the mothball fleet for reconditioning.

An inspection of the tanker KAN-

dent of the association, and Col. George P. Dixon, Executive Vice President, both of whom addressed the meeting.

The officers honored at the reception were: Maj. Gen. Raymond C. Maude, Commander, Air Force Cambridge Research Center; Rear Adm. John A. Snackenberg, Commandant, First Naval District; Col. W. C. Heinel, Commanding, Boston Army Base; and Capt. W. R. Richards, Commandant, First Coast Guard District.

The dinner-meeting was held at the Officers' Club of the U. S. Naval shipyard in Charlestown, with a social hour preceding.

Cayuga

Regular officers were elected at the



Shown at the head table at Atlanta Chapter's September meeting; front row (l to r): C. M. Eberhart, R. J. Smith, Col. George Dixon, Ralph Grist and I. J. Carmack; back row (l to r): Jack Evans, Col. A. R. Morley, Kelly Mosley, W. H. Mansfield and C. W. Thorp.

KAKEE, with particular attention to its communications equipment, was the final highlight of the tour.

Assembling in the company cafeteria for cocktails and dinner, the chapter was welcomed by William H. Jory, Maryland Drydock Company Vice President in charge of sales, estimating and engineering. Mr. Jory presented some interesting data on the operations of the Fairfield Yard, including a notation that one of the largest carriers traveling the Great Lakes, over 700 feet long, had been berthed in the Maryland Drydock yard.

Chapter President Don Lee also introduced the following other officials of the host company: John D. Frack, director of engineering, estimating and industrial divisions; Gerald V. Walls, general superintendent; Herman A. Feldman, manager of sales; and the guides who had conducted the tour of the facilities.

Boston

A reception for the Armed Forces commanding officers in the area opened the Boston Chapter's fall season of activity. Special guests of the chapter were George W. Bailey, National Presi-

chapter's first annual meeting as follows: president—Donald T. Olmsted, General Electric Advanced Electronics Center; vice-presidents—R. L. Wooley and S. M. Kaplan; treasurer—M. Seymour; secretary—R. O. McCary. Members of the board of directors are: W. A. Schmidt, General Aniline & Film Corp.; M. Bliven and Brig. Gen. T. C. Rives, General Electric; and E. W. Ritter, Westinghouse Electric Corp.

Chapter constitution and by-laws were adopted and plans were made for future meetings.

At its September 15th meeting, the chapter received its official charter from Col. Theodore L. Bartlett, AFCA regional advisor. In making the presentation, Col. Bartlett stressed the aims and objectives of the association and suggested ways and means of building the chapter into an effective and worthwhile unit.

Chicago

At its annual meeting on August 10th, new officers were chosen as follows: president—Fritz Franke, Hallicrafters Company; vice-presidents—Carrington H. Stone, consulting engineer; Daniel E. Noble, Motorola Corp.; Raymond



Dayton-Wright meeting on "Future Development of Electronic Components". Left to right, speakers Harrel E. Noble and Charles Doyle of Wright-Patterson AFB and Chapter President Roy L. Merwin, Jr.

K. Fried, attorney; secretary-treasurer—Henry J. McDonald, Kellogg Switchboard and Supply Co.

Board of directors—William C. DeVry, Paromel Electronics Corp.; Col. Robert Finkenstaedt, Air Materiel Command; Col. John R. Howland, Stewart-Warner Corp.; Raymond W. Johnson, American Telephone & Telegraph Co.; James H. Kellogg, Kellogg Switchboard and Supply Co.; Col. B. L. Mathews, Signal Corps Supply Agency; Emerson E. Mead, Kleinschmidt Laboratories, Inc.; Brig. Gen. Frank Meade, Automatic Electric Company; Capt. E. F. Metzger, Great Lakes Naval Training Station; D. B. Miller, Coyne Electric and Television Radio School.

In taking over the presidency, Mr. Franke expressed the appreciation of the entire membership for the outstanding leadership of William DeVry, retiring president. He also commended Carrington Stone, chairman of the program committee, for the fine caliber of meetings during the past year.

Dayton-Wright

"Future Development of Electronic Components" was the subject of the chapter's September 23rd meeting at the Biltmore Hotel, with Charles Doyle and Harrell Noble of Wright Patterson Air Force Base as the speakers.

In discussing this rapidly advancing field, the speakers covered items now in production or nearing production and made predictions as to what the future might bring. Samples of the items discussed were used to illustrate. First covering active components, such as electron tubes, miniature and sub-miniature tubes, ceramic tubes, microwave tubes, display tubes, etc., the speakers went on to describe the passive components—resistors, inductors and capacitors.

Speaking of the transistor, Messrs. Doyle and Noble pointed out that it will do much during the next several years to revolutionize the science of electronics and widen the field of its applications. In this connection, a 60-watt germanium transistor developed by the Minneapolis Honeywell Co. was displayed to the public for the first time.

In the field of variable resistors there is a phenomenal growth in the use of precision potentiometers, and it was

predicted that the future will bring nuclear potentiometers which will supply their own voltage output, will have infinite resolution and will have extremely long life since there will be no moving contacts.

Another item mentioned was the tantalum electrolytic capacitor which, it was pointed out, does not deform or deteriorate with storage, making it very desirable for military applications; in addition, it operates over much wider temperature ranges.

The increasing use of ferroelectric materials was stressed, with predictions of many diversified applications. It was also reported that much is being accomplished in the field of inductors and metallic magnetic cores.

For frequencies above 10,000 cycles, a new magnetic material, ferrite, is obsolescing all other materials, the speakers said. For example, ferrites are finding many new applications in microwave equipments, they can be used for constructing electrically tuned cavities, etc.

On the subject of relays, the audience heard the forecast that transistors, double based diodes and magnetic amplifiers will replace relays because they will be more reliable due to the absence

of any moving parts. Another prediction was that the development of improved ferrites and dielectric materials would result in a tremendous reduction in the size of wave guides.

Connectors are keeping pace with the rest of the components, the speakers reported—not only are they being reduced in size but are also refined for operation at higher altitudes without the formation of corona. It was also stated that rotary seals are being developed to provide greater reliability to rotating components.

The authoritative picture of the rapidly changing field proved to be of considerable interest to the AFCA group. At the conclusion of the talks, the members inspected the different components displayed.

This meeting was the first in a series of excellent programs which have been mapped out for the balance of the fiscal year. Committee chairmen responsible for the various phases of chapter activity are: A. L. Holt, finance; W. F. McKeehan, membership; A. S. Lord, national security; Ralph Root, program; Col. J. B. Cross, publicity.

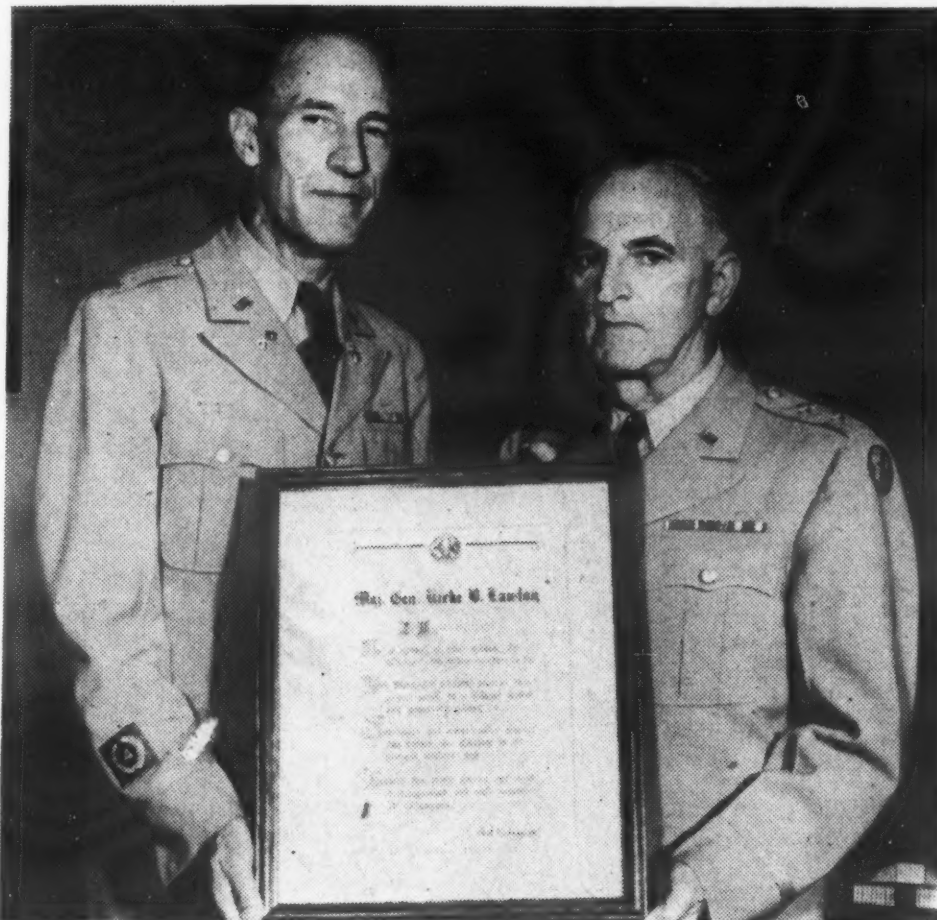
Far East

The executive council of the Far East Chapter met at Yokosuka Naval Base on September 15th to make plans for the resumption of chapter activities.

Due to the transfer of various chapter officers, the first item of business was the appointment of their successors. As a result, the following is the slate of officers of the Far East Chapter until the annual election in the spring: president—Capt. F. C. B. Jordan, USN; vice-presidents—Brig. Gen. Albert F. Cassevant, SigC; Col. Charles J. Harrison, AF; Preston Shivers, Philco; treasurer—Capt. Lawrence E. Echelmeyer, AF; secretary—Capt. Lester D. Fowler, SigC.

It was decided to hold general membership meetings bi-monthly with one of the armed services or a civilian or-

Fort Monmouth Chapter President Paul Langguth awarding the chapter certificate of appreciation to Major General Kirke B. Lawton upon his retirement.



ganization acting as sponsor for each meeting. The council also decided to take action to reorganize the Far East Chapter along more realistic lines so as to embrace those areas of common interest. Each center of military population will be encouraged to form their own local chapter. Details of the proposed reorganization will be worked out as soon as possible.

Upon adjournment of the executive council meeting, Captain Jordan conducted the members on a tour of the Naval communications facilities at Yokosuka Naval Base.

Fort Monmouth

The chapter ushered in its fall season of dinner meetings on October 7th with Dr. Bruno Furst, leading author and lecturer in the field of memory and concentration, as the featured speaker.

Formerly associate professor of psychology at Masaryk's Peoples University in Prague, Dr. Furst is now head of his own School of Memory and Concentration in New York. He led off his talk by mentioning the growing importance that has been attached to memory in the last ten to twelve years. Memory means strict attention and close observation, he related, and it is possible for anyone to improve his memory. Using ideas already retained as "pegs" upon which to hang new ideas is the way Dr. Furst described the use of association.

To prove his point, he conducted a number of exercises using several of his memory students. In one instance, a 100-page magazine was distributed to a number of guests. A student familiar with the magazine was asked from the audience to relate the contents of a particular page number called out. He did this with little or no trouble. In another instance, a series of 20 words was called out from the audience and written on a blackboard. Two students with their backs to the board gave back the entire list after hearing it only once and in any combination asked for.

In a third exercise, people stood up in the audience and gave their names to the Furst students. Without delay

the students pointed to and gave back every one of the more than 25 who stood. Still another example showed students who had heard all the cards called off in three hands of playing cards repeat from memory all the cards in the remaining hand. Within this technique, related Dr. Furst, lies the answer to most of the clever parlor tricks.

There is no such thing as a person with a good or bad memory, the speaker pointed out. A mind must be trained to retain information as well as grasp it quickly, and all people are capable of improving this ability.

The meeting and the social hour which preceded it was held at Gibbs Hall Officers' Club, with an attendance well over 250 members and guests.

When Maj. Gen. Kirke B. Lawton retired from the service early in September, the chapter presented him with a scroll citing his support of the chapter during his two and a half years as commander of Fort Monmouth. During the award presentation, General Lawton, a charter member and a national director of the association, was aptly termed one of the "founding fathers" of the AFCA by Chapter President Paul Langguth.

Geneva

Petition for charter for a Geneva sub-chapter of the Paris Chapter was received and approved at national headquarters late in August. The official charter was forwarded to the parent chapter and will be presented as soon as the necessary arrangements can be made.

The chairman of the new unit is Col. John H. Gayer of the International Frequency Registration Board, and the secretary-treasurer is Cdr. Gerald C. Gross, Assistant Secretary General, International Telecommunications Union. The other charter members are: Maurice Anthony, Lockheed Aircraft; Robert Lindsey, International Telecommunications Union; and Col. Dane Sprankle, American Embassy, Berne.

Gulf Coast

"Broadcasting in the Gulf Coast Area" was the subject of the chapter's September meeting, with Doug Gabrielson, program director of Radio Station WLOX, Biloxi, and T. B. Majure, chief engineer and sales manager of WLOX, as guest speakers.

Calling on his experience in both television and radio broadcasting, Mr. Gabrielson compared the production of a typical radio program with an equivalent television program. He said that thirteen persons are required to present a televised newscast whereas a radio news program requires only three people. His conclusion was that "television may appear to be most popular, but AM radio will be around for a long time".

A television station on channel 13, transmitting a consistently useable signal up to 30 miles from the station, is in the plans at WLOX, Mr. Majure informed the group. Commenting on the high reliability of AM transmitting equipment, he said that in his many years at WLOX he had experienced only two prolonged off-the-air periods due to equipment failure. One of these breakdowns was caused by the severe hurricane of 1947 when pounding ocean waves broke the antenna feed line. Stretching a wire to a nearby water tower for a temporary antenna shortened the off-the-air time.

Hawaii

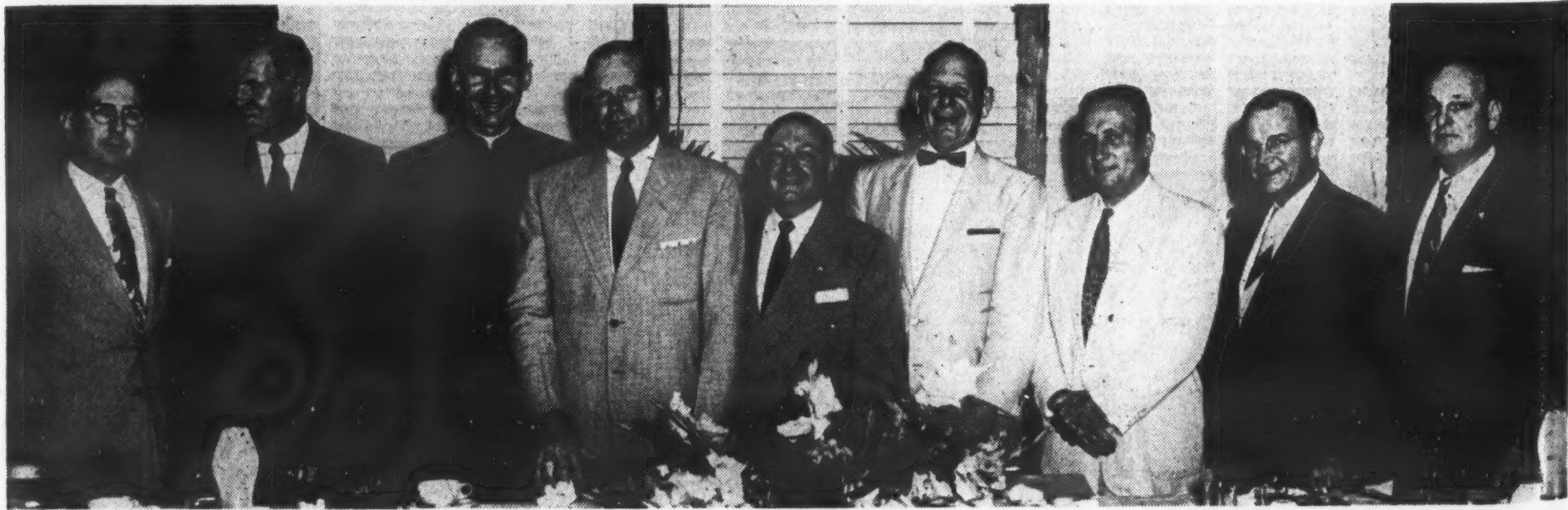
A dinner-dance, sponsored by the Air Force members of the chapter, was held on September 24th at the Cannon Club, Fort Ruger.

The Cannon Club, which is noted for its fine food and excellent view of the City of Honolulu, was a perfect setting for a most enjoyable evening.

London

A special guest of the chapter at its business meeting on August 23rd was Vice Adm. Walter S. Anderson, president of the New York Chapter. Admiral Anderson gave a brief talk on committee work within a chapter, exchange of ideas and the overall need for good relationship and liaison with the British associate members.

Officers and guests of the Louisiana Chapter at its meeting in honor of Capt. Jack Roudebush: (l to r), J. D. Bloom, treasurer; Adm. John M. Higgins, commandant 8th Naval District; Father W. Patrick Donnelly, S.J., president, Loyola University; Capt. Roudebush; C. C. Walther, president; Brig. Gen. H. R. Duffie, CO, New Orleans Port of Embarkation; Rear Adm. W. F. Riggs, Jr., USN (ret.); Capt. H. W. Stinchcomb, executive officer, 8th CG District; and A. B. Hay, secretary.





We taught the phonograph how to keep time

(and better High Fidelity wasn't the only result)

Engineers have long recognized that it is impossible to obtain High Fidelity from *any* phonograph unless the record is played at the exact speed at which it was recorded. It is a surprisingly little known fact that even the finest record players vary in turntable speed at time of manufacture and get worse as they grow older. A variation of only one rpm in turntable speed will make an LP record sharp or flat by a full quarter tone.

Zenith engineers tackled this problem, and they came up with a speed control for phonographs that provided the answer. The control has two simple parts. One is a fully variable speed regulator capable of any speed from 10 to 85 RPM (including $33\frac{1}{3}$, 45, 78 and the new Talking Book speed of $16\frac{2}{3}$ RPM). A slight adjustment of this regulator compen-

sates for any gain or loss of speed in the turntable.

Part two was the stroboscope speedometer. It showed by dots of light when the record was playing at exact studio recording speed. The stroboscope, operating in conjunction with the speed regulator, assured, for the first time, that you could play every record at the speed necessary for true High Fidelity reproduction.

Better music from recordings wasn't the only result. Such continuing electronics research at Zenith yields two benefits:

One is better radionics products for home enjoyment. The other is equally important. Over the years, Zenith's specialized experience in radionics has served the U. S. government with better weapons of defense.

When additional production was needed during the Korean emergency, the Government looked to Zenith for production of proximity fuses. This trust resulted from Zenith's experience in radionics and Zenith's World War II production records.

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COPR., 1954



San Francisco Chapter activities. Above, at joint meeting with West Coast Electronic Manufacturers Association (l to r): Maj. Gen. Frank E. Stoner; Maj. Gen. James A. Code; Maj. Gen. George I. Back, guest speaker; J. J. Halloran, San Francisco Council Chairman, WCEMA; Col. Lloyd Parsons, AFCA Chapter President; and E. P. Gertsch, President, WCEMA.

Mr. Charles J. Hirsch, chief engineer of the research division of the Hazeltine Corporation, spoke on "Color Television" at the chapter's September 23rd meeting. Mr. Hirsch, who had served on the National Television System Committee which produced the color specifications now adopted in the U. S., was eminently qualified to present this subject.

An added feature on the program was "Operation Threshold," the NBC kinescope recording of the actual color television pictures of the tactical demonstration at Fort Meade in August.

The dinner-meeting was held in the Criterion Restaurant, Piccadilly Circus, with 130 members and guests present. Chapter President C. G. Mayer officiated as master of ceremonies. Among the guests was Mr. Codel, managing editor of the Radio News Bureau, New York, who reported to the gathering the latest developments in color television facilities in the U. S.

Louisiana

Chapter activities during the summer months were recently reported as follows:

A dinner-meeting was held at the New Orleans Naval Air Station on July 21st in honor of Capt. Jack Roubush, commanding officer, who was being transferred to sea duty. Among the distinguished guests present were: Adm. John M. Higgins, commandant, 8th Naval District; Brig. Gen. H. R. Duffie, commanding officer, New Orleans Port of Embarkation; Rev. W. Patrick Donnelly, S.J., president of Loyola University; Capt. Neville Levy, USNR (Ret.), representing Governor Kennon; Councilman Victor Schiro, Acting Mayor of New Orleans; Col. Provosty Dayries, Asst. Superintendent of Police; and representatives of numerous other organizations.

Several joint meetings with other associations were also held. One was with the Radio, Television and Appliance Association of New Orleans, at which Robert Shelby, vice president and chief engineer of the National



Above, Rear Adm. John R. Redman, Commandant of the 12th Naval District, addresses the August 31st meeting. L to R: Col. A. B. Cooper, SigO, Sixth Army; Gen. Stoner; Col. Parsons; and George Bailey, National AFCA President.

Broadcasting Company, discussed "The Present and Future of Color in Television." The other joint meeting was held with the Young Men's Business Association in honor of Capt. Frank Leamy, commander of the 8th Coast Guard District, who was leaving New Orleans for reassignment.

New York

Mr. J. Ernest Smith, assistant vice president and director of equipment engineering, Raytheon Manufacturing Company, was principal speaker at the chapter's opening meeting of the fall season on September 27th.

New developments in radio communications were discussed by Mr. Smith, including radio astronomy, HF radio propagation forecasts, COZI, and amateur single sideband phone. An added feature was a film, "Ready for Sea," which illustrated a simulated voyage that a marine radar must weather before it is pronounced ready for sea.

Col. George Dixon, Executive Vice President, was present and reported to the membership on the national and local activities of the association.

Col. Benjamin H. Oliver, Jr., national convention chairman, reported on the progress of plans for the convention which will be held on May 19-20 at the Hotel Commodore, New York, and May 21 at Fort Monmouth.

The dinner-meeting was held at the

Belmont Plaza Hotel, with a cocktail hour preceding. Members unable to attend the dinner are always welcome at the meeting itself.

North Texas

The chapter's activities in the late summer consisted of social meetings. In August, the chapter staged a dinner-dance at the officers' club of the Naval Air Station in Dallas. Its September affair was a ranch style party at Wiley's Dude Ranch, eighteen miles from Dallas, where members and their guests enjoyed swimming, a chuck wagon dinner, and dancing in the "old red barn."

Pittsburgh

One hundred and ninety persons turned out for the first event of the fall season on September 15th, confirming again the fact that the Pittsburgh Chapter, in comparison to numerical strength, has the best attended meetings of any chapter in the association.

As customary, this opening event featured a program of fellowship and fun. In the words of the chapter report:

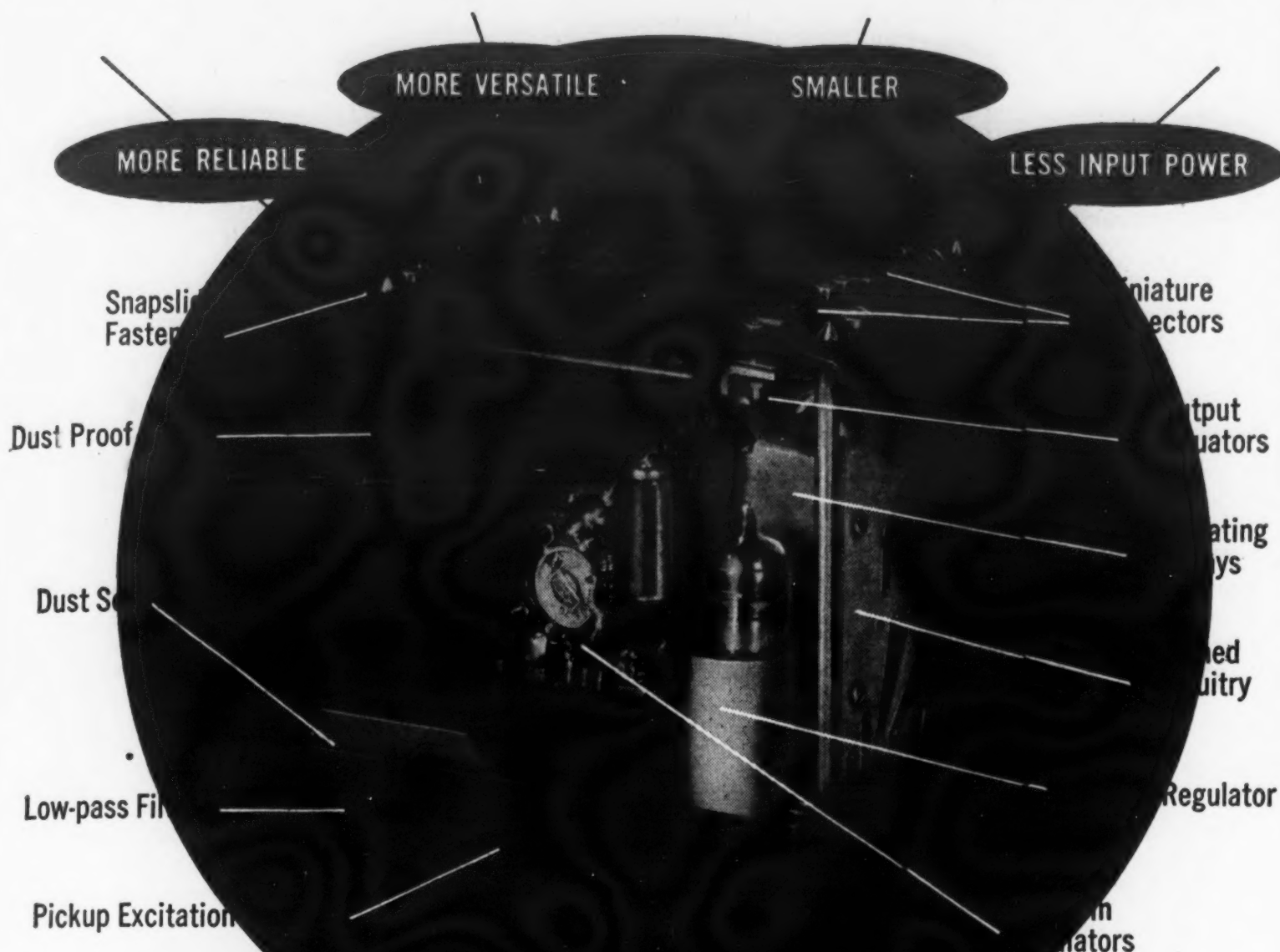
"The party got off to a fine start at South Park's Totem Pole Lodge, scene of last year's Fish Fry. This meeting was titled an 'Ausflug' and, Pennsylvania Dutch or not, the boys did a lot

(Continued on page 48, col. 1)

Convention Ahead

Plan NOW for the 9th Annual AFCA Convention, May 19-20-21, 1955 in New York City. Have the largest representation from your chapter to ever attend an AFCA Convention hear experts discuss the theme, "Global Communications". Meet your friends from all over the world, see exhibits of the latest equipments at the biggest and best AFCA Convention!

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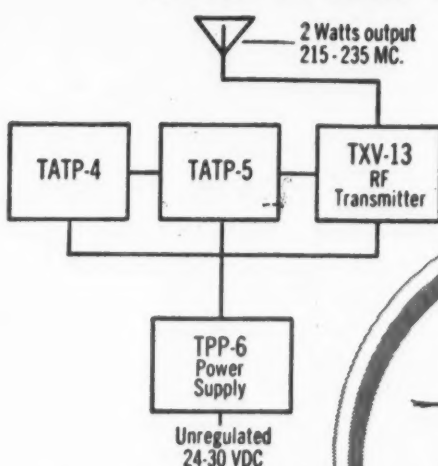
	TATP-4	TATP-5
No. of bands	4	6
Subcarrier bands	1.7 kc. to 70 kc.	1.7 kc. to 70.0 kc.
Oscillator Types	TOE-30V, TOE-31V, TOR-8V, TOR-9V, TOL-9V	Same as TATP-4
Input Voltages	6, 12, or 24 VDC $\pm 10\%$ 150 VDC $\pm 10\%$	6, 12, or 24 VDC $\pm 10\%$ 150 VDC $\pm 10\%$
Weight (Less Oscillators)	Approx. 2 lbs.	Approx. 3 lbs.
Dimensions	5.0" x 5.0" x 4.5"	5.0" x 7.5" x 4.5"

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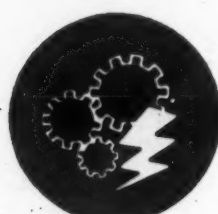
HYDRAULICS



TELEMETERING



ELECTRO-MECHANICAL



ULTRASONICS



CHAPTER NEWS

(Continued from page 46, col. 3)

of 'flying out.' After a check at the door where the members were given door favors, all headed for the beer barrels to officially sample as many glasses of beer as possible. In order that no one's thirst became satisfied a snack bar was set up and a large quantity of delicious deviled crabs, potato chips and pretzels were consumed. The members sang songs and in high good humor sat down to a fine dinner provided by a caterer. A three piece combo played during the meal.

"After dinner there were cards, dart-boards and horse shoes available. A prize drawing was held and forty-eight gifts were drawn. These gifts were provided by companies and individuals friendly to the AFCA. The meeting adjourned considerably later on a very jovial level."

San Francisco

The chapter held a well-attended mid-summer meeting on August 31st marked by the presence of George W. Bailey, National President of the AFCA, Rear Admiral John R. Redman, Commandant of the 12th Naval District, and Major General Frank E. Stoner, USA (Ret.).

Mr. Bailey brought a brief message to the chapter from national headquarters, scoring the aims and purposes of the association. He emphasized the importance of the association in just one aspect by recalling some of his experiences in recruiting technicians and scientists to work with the Armed Services in World War II. He urged continuing strong local endeavour as the key to a strong national organization.

Admiral Redman, an honorary life member of the AFCA and presently affiliated with the San Francisco Chapter, was the main speaker of the evening. Admiral Redman talked about the work of the 12th Naval District, which he commands, and about some recent developments in naval equipment. Drawing from his long service in naval communications, beginning with his amateur radio days as an ensign to his World War II experience as communications officer for Admiral Nimitz in the Pacific and his later duties as Director of Communications-Electronics for the Joint Chiefs of Staff, Admiral Redman brought home strongly to his audience the importance of communications in naval operations.

The chapter officially welcomed into its ranks General Stoner, whose work as Chief of Communications for the Chief Signal Officer during World War II—in charge of world-wide Signal Corps communications—and as Director of Communications at United Nations headquarters after the war, is known to his many friends throughout the Armed Forces. General Stoner is pres-

ently affiliated with Varian Associates, Inc., at Palo Alto.

On September 8th, the chapter met jointly with the San Francisco Council of the West Coast Electronic Manufacturers Association to hear an address by Major General George I. Back, Chief Signal Officer, on the status and use of television on the field of battle as a source of information on which to base command decisions.

New television equipment devised for the Army ground forces can give a field commander a view of everything going on in the sector under his command, General Back said. The new camera can spot sandbags around a machine gun nest at 1000 yards, can distinguish between a jeep and a truck

and commercial and military communication activities from the Northern California area.

Scott—St. Louis

Rear Admiral William B. Ammon, Director of Naval Communications, spoke on "Integration of Communications" at the chapter's first fall meeting on September 16th.

For the benefit of all AFCA members, Admiral Ammon's address is printed in its entirety on page 26 of this issue.

South Carolina

An inspection tour of the new type destroyer, the USS SAUFLEY, at the



Above, head table at Southern California's dinner-meeting in honor of Maj. Gen. George I. Back. L to R.: Col. Holman R. Dillard, chapter director; Mrs. Dillard; General Back; Richard Fuller, president; Larry LaHar, vice president; Frank J. Buckey; Les Daniels, secretary-treasurer.



Members and guests of the Southern California Chapter who attended the dinner-meeting to hear General Back discuss the use of television in combat.

at six miles and can obtain good detail as far as 26 miles. Nicknamed the "walkie-lookie", the device can be carried by one man or mounted on reconnaissance planes or combat vehicles. The General also pointed out that the camera was designed to broadcast its signals back to a command post, where a screen could be studied by officers.

General Back's talk was supplemented by slides, and motion pictures taken from the NBC color telecast of the Fort Meade field maneuvers to demonstrate the possible uses of television in combat. The film included explanatory remarks by General Matthew B. Ridgeway, Army Chief of Staff; Brig. General David Sarnoff, Chairman of the Board, Radio Corporation of America; and General Back.

The dinner-meeting was held at the Peninsula Country Club in San Mateo and was attended by three hundred of the top men in electronic manufacturing

Charleston Naval Base was the highlight of the chapter's September 24th meeting.

Special guests of the chapter were Captain Countryman, Electronics Officer, and Commander Bradley, Industrial Manager, of the Naval Base; AFCA Executive Vice President George Dixon; and Ralph Grist, Military Services Coordinator, Southern Bell Telephone and Telegraph Co. and AFCA regional advisor.

A report from Colonel Dixon brought the membership up to date on AFCA affairs. The NBC kinescope which had been shown at the Atlanta and Augusta-Camp Gordon meetings was also shown for the benefit of the South Carolina members and guests.

Prior to the tour, an enjoyable social hour and dinner was held at the Officers' Club of the base. The meeting was presided over by Col. John L. H. Young of the Southern Bell, Columbia.

Southern California

Chapter officers and directors held an informal luncheon meeting in honor of AFCA National President George W. Bailey during his visit to the west coast in August. In a discussion of AFCA affairs, Mr. Bailey emphasized that the aims and objectives of the association can best be carried out by strong and active chapters.

Those present were: Les Daniels and William A. Cooke of Audio Products Corp.; Robert O. Vaughan, Hoffman Laboratories; Lewis W. Imm, Librascope; Col. Frank J. Shannon, Sr., Hq. Air Materiel Command; T. F. Wellings, Radioplane Co.; Charles F. Horne, Convair; Larry LaHar, RCA; Lloyd C. Sigmon, Station KMPC; Hobart R. Yeager, Lockheed; John O. Aalberg, RKO Studio; Lew Howard, Triad Transformer; A. N. Curtis, RCA; John W. Inwood, Western Union; Ralph W. Scott and George Ahrens of RCA Radiomarine; Bernard H. Landon; Art Crawford, Crawford's Inc.; and E. M. Webster, FCC.

The chapter called a special meeting on September 10th when it was informed that Major General George I. Back, Chief Signal Officer, would be in Los Angeles at that time.

With only a few days notice, fifty-five members and guests turned out to welcome the General and to hear him discuss the use of television in combat. The NBC kinescope recording of the tactical television demonstration at Fort Meade followed General Back's talk.

Librascope, Inc., was host to the chapter at its new plant in Burbank on September 22nd. Members and guests toured the facilities prior to the meeting and were impressed with the advancements and vast scope of Librascope's research and development activities, as well as the architectural beauty and efficiency of the new building.

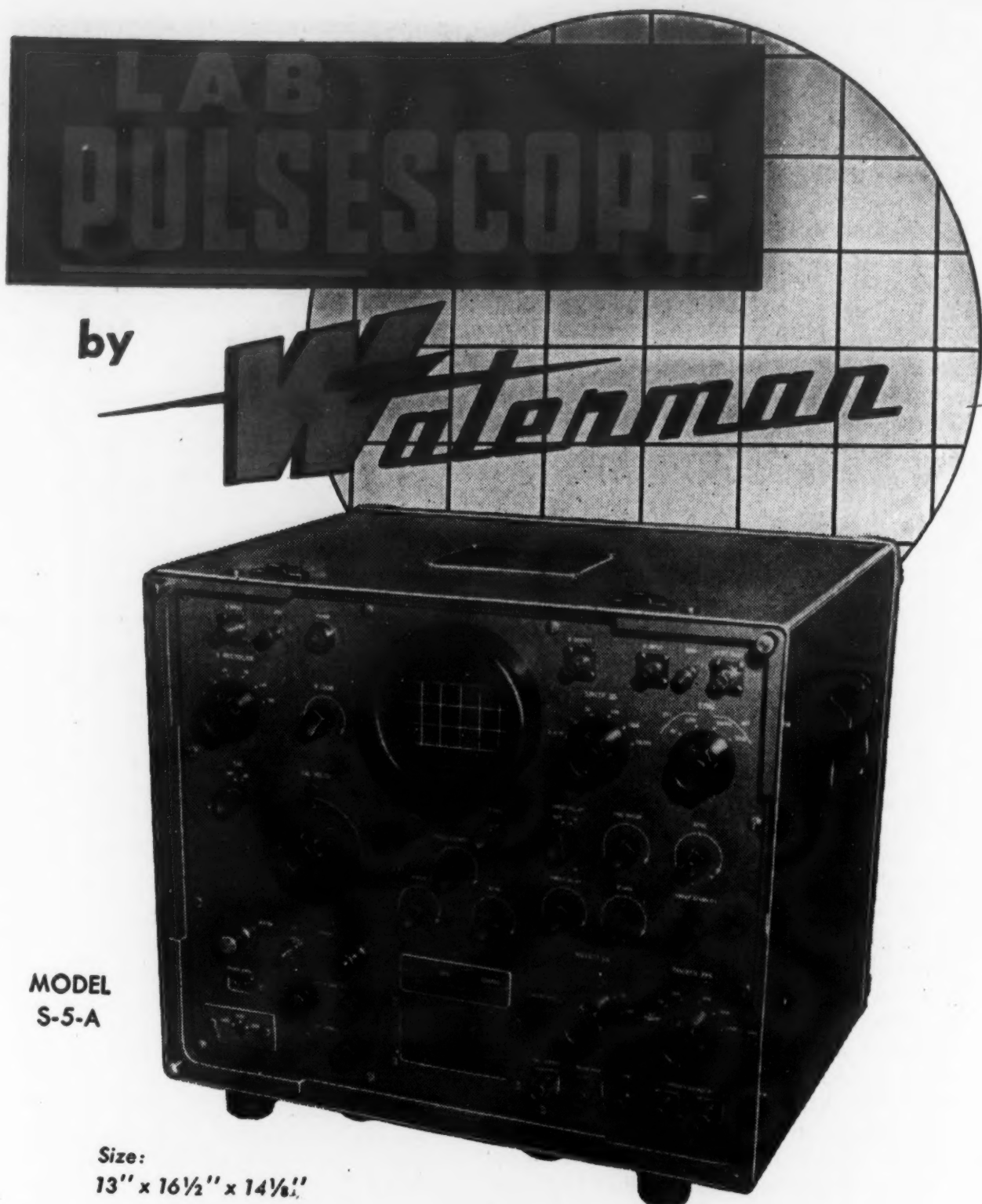
The chapter was welcomed by Lewis Imm, president of Librascope, who was host at a cocktail party which followed the plant tour.

Principal speaker of the evening was Col. Lloyd C. Parsons, president of the San Francisco Chapter and regional advisor for the AFCA and former Signal Officer of the Sixth Army. Colonel Parsons first gave a brief history of the efforts to organize the Southern California Chapter and congratulated the group on its enthusiastic reorganization program. He then told of his activities in setting up the communications system for the Korean War and cited the cooperation received from the electronics industry.

(Continued on next page)

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CHAPTER NEWS

Southern Connecticut

Mr. Clarke Quackenbush, Manager of the Electronic Division of Whitney Blake Company, discussed the latest developments in A-N connectors at the opening meeting of the fall season.

The meeting was held on September 30th at the Wonder Bar restaurant in Bridgeport, with an attendance of fifty-five members and guests. The Dictaphone Corporation was announced as a new group member and its representatives, headed by T. N. Beard, Vice Chairman of the Executive Committee, were introduced and welcomed into the chapter.

South Texas

Attention was focused on the Federal Bureau of Investigation at the chapter's August 24th meeting. The speaker was Vernon Bailey of the local FBI unit, who discussed some of the tools and products of science utilized in apprehending criminals and saboteurs. He also pointed out that the Bureau is always interested in new types and uses of photographic, communications and electronic equipment which would increase its capability in crime detection.

Mr. Bailey's talk was followed by a color film, "A Day with the FBI", which covered a tour through the FBI building in Washington and showed how scientific methods are utilized to identify and apprehend criminals.

Lt. Col. Emil Kontak, Comptroller of the San Antonio Air Materiel Area, addressed the September 22nd meeting at the Kelly Air Force Base Officers Club. He presented an enlightening picture of the Air Materiel Area, its concept, the parent organization, the zonal concept and the organizational structure of SAAMA and its role in the overall Air Force mission.

At the conclusion of his remarks, Colonel Kontak showed a film entitled "The Eagle's Strength" which aptly supplemented his talk.

In the absence of the president, the dinner-meeting was presided over by Col. Francis B. Morgan, USAF Security Service, a vice-president of the chapter. Maj. W. L. Weaver of the membership

Shown at the South Texas Chapter meeting which featured an FBI program (l to r): Brig. Gen. H. H. Bassett, AF Security Agency; Vernon Bailey, guest speaker; Col. George L. Richon, chapter president; Trevor Clark, vice president.



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YOUR
FAMILY



fight TB
•
BUY AND USE
CHRISTMAS SEALS

committee reported that the South Texas Chapter was currently in the lead in the annual AFCA "Chapter of the Year" contest.

Tinker-Oklahoma City

On September 23rd, chapter members and guests toured the Mustang plant of the Oklahoma Gas & Electric Company. The plant, located ten miles west of Oklahoma City, is the largest electric power generating plant of the OG&E system, and the conducted tour was of considerable interest to the group.

The chapter was welcomed to the plant by Mr. Brewer, its Chief Engineer, and introductions were made by William A. Kitchen, OG&E engineer, and a member of the chapter. Following the tour, the company was host at an enjoyable social hour.

Washington

All the free western European nations have completely accepted the im-

portance of mutual security in defense, Major General Francis L. Ankenbrandt, Commanding General of the Airways and Air Communications Service at Andrews Air Force Base, told the chapter at its October 13th luncheon meeting.

General Ankenbrandt stated that the importance of communications between western European nations in their defense plans was recognized in the allocation of 400 million dollars, which was one-third of the total budget for the Infrastructure program of the North Atlantic Treaty Organization. The telecommunications network, which will eventually extend from Norway to eastern Turkey, is primarily for military command communications but is valuable in peace to augment the civilian communications systems of the various European countries, he told the gathering, and expressed the view that the new London conference agreement would strengthen the NATO countries in the goal toward mutual defense.

General Ankenbrandt, who had recently returned from three years' as Chief Signal Officer of SHAPE, was welcomed back by a record turnout of

An Invitation

Colonel Frank W. Wozencraft, president of the Washington Chapter, invites all AFCA members throughout the world to attend Washington Chapter luncheon meetings when they are in the Washington area. The meetings are held at the National Press Club, 14th and F Streets, Northwest, on the first Wednesday of every month. When you arrive, give your name to a member of the Reception Committee so that you can be introduced to the gathering.

some 350 members and guests who filled to capacity the ballroom of the National Press Club.

The group was also addressed by George W. Bailey, AFCA National President, who restated the objectives of the association and emphasized the need for strong and active chapters. He also reported that during his recent trip over the country he had visited various chapters and had been impressed with the interest and enthusiasm of the members. In conclusion, he said, "AFCA is our chapters, our chapters are our members, and our members are you and me. The mission of the AFCA is the mission of every one of us."

The speakers and guests and members at the head table were introduced by Chapter President Frank W. Wozencraft as follows: Maj. Gen. George I. Back, Chief Signal Officer of the Army; Maj. Gen. James D. O'Connell, Deputy Chief Signal Officer; Rear Adm. William B. Ammon, Director of Naval Communications; Capt. L. S. Howeth, Deputy Director of Naval Communica-



Maj. Gen. F. L. Ankenbandt addressing the first fall meeting of the Washington Chapter which drew a record attendance. Names of those at the head table appear in the report below.

tions; Brig. Gen. A. L. Pachynski, Deputy Director of Air Force Communications; Capt. Garrett van A. Graves, Chief of Communications, U. S. Coast Guard; Rear Adm. Frederick R. Furth, Director of Naval Research; Mr. Rosel Hyde, Commissioner, FCC; Mr. Robert T. Bartley, Commissioner, FCC; Mr. William A. Porter, former Asst. Director for Telecommunications, ODM, and former President of the Federal Communications Bar Association; Maj. Gen. Harry C. Ingles, former Chief Signal Officer and former President of RCA Communications; Maj. Gen. Francis H. Lanahan, Asst. Deputy

Chief of Staff for Logistics; General Ankenbrandt; Mr. Bailey, who in addition to being President of the AFCA is Executive Secretary of IRE; Col. George P. Dixon, AFCA Executive Vice President; Mr. Thomas B. Jacocks, immediate past president of the chapter; Rear Adm. Joseph R. Redman, former Director of Naval Communications, and National President of the AFCA last year; Col. Percy G. Black, past president of the chapter and chairman of the 1954 national convention; Mr. John F. Gilbarte, chapter vice-president; Mr. M. C. Richmond, secretary-treasurer; Col. Ralph L. Walker,

chapter counsel; Mr. John T. Kent, vice chairman of the program committee; Mr. George Sheets, chairman of the membership committee; and Mr. Kenneth W. Heberton, chairman of the publicity committee.

It was announced that the Washington Chapter would meet each month through June and that each meeting would have a separate program chairman. The next two meetings will be arranged by two of the chapter's vice-presidents: John Gilbarte will handle the November program and Maj. Gen. F. H. Lanahan will make arrangements for the December meeting.

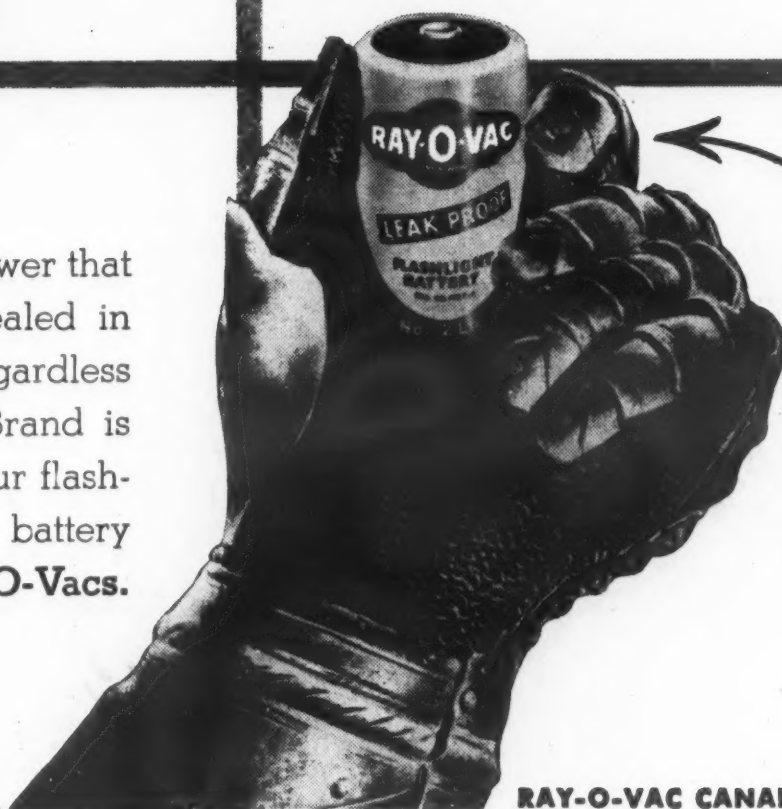


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NEWS

Communications-Electronics-Photography

THE ARMY STARS

New Movie on View Soon

The American public will have an opportunity to get a close look at how the U. S. Army accomplishes its global mission when a new motion picture is released to the nation's movie houses in December. "This Is Your Army" is a 55 minute documentary in full color, starring the individual soldier.

From mid-December until mid-April, the film will be shown in some 13,000 theaters all over the United States. It will be premiered in Washington with President Eisenhower leading the list of dignitaries expected to be on hand.

Two years in the making, "This Is Your Army" was produced by Fox Movietone News, Inc., under supervision of the Army's Chief of Information and the Signal Corps.

Scenes in the picture were shot at 24 important Army installations in the United States, Alaska and Panama, and at more than 30 different locations in Korea, Japan, Okinawa, Formosa, Greece, Turkey, Italy, Germany and France.

The film opens with a prologue that outlines the vital role being played by our Army today and introduces a comprehensive and realistic picture of the world-wide responsibilities and operations of our far-flung military forces. Some aspect of every specialized service is portrayed in sequences of the film.

The realism stressed throughout the picture, with close attention to minute details and authentic color treatment, carries the production toward a new high in the documentary film field.

The emphasis throughout the film is placed on the individual soldier and the theme is simply that, despite the latest push-button warfare techniques, despite the tremendous amounts of materiel and equipment available to our forces, it is spirit and determination based on democratic ideals and hard-won heritage, that will forever be the greatest challenge to would-be aggressors.

NEW ALL-TONE SUPERVISORY CONTROL SYSTEM

New supervisory control equipment designed for use with any type of

communications equipment capable of carrying audio signals, including microwave and very high frequency radio as well as power line carrier and wire lines, has been developed by Motorola's Communications and Electronics Division.

Unlike conventional remote control apparatus using multi-conductor cables, whose installation and maintenance costs can become prohibitive as distance increases, this system is well suited to operation over long distances.

It enables an operator to control and supervise remote circuit breakers, valves, pumps, generators, motors, etc., and at the same time automatically provides a continuous indication of their position. Alarms can be added to notify the operator of high or low voltages, liquid levels, temperatures, pressures, flows, etc.

One feature of this new system is the two step "select before operate" sequence that helps prevent errors. After the device to be operated has been selected by pressing the proper button, a coded signal using two specific frequency tones in sequence is transmitted to the remote location to verify the setting of the device at that time. Automatically, another coded signal is returned to the master control panel to confirm the position of the remote device ("on" or "off" for a motor or "open" or "closed" for a valve).

This confirming signal also actuates a white light that indicates that this device has been selected and is ready for the operation to be performed.

The partially completed structure pictured below is the Signal Corps Engineering Laboratory's new "Hexagon," a \$22,000,000 building which will eventually house the entire Laboratory functions now carried out in four different locations. The new building at Fort Monmouth, already one-third occupied and slated for completion by 1958, was dedicated the last week of September before a gathering of more than 500 dignitaries. Donald A. Quarles, Assistant Secretary of Defense for research and development, gave the dedicatory address, emphasizing the importance of basic research to our national security.



All points in this system can be confirmed at the rate of one every one and one-half seconds.

FIRST MORSE RADIO ROBOT OPERATION ANNOUNCED

After many preliminary conferences with military and industry communications personnel, the engineers of CGS Laboratories, Stamford, Conn., have developed the first practical all-electronic equipment capable of functioning as a human brain converting Morse signals to the printed word.

When the robot is operated by visual means, it duplicates the human eye in scanning a standard Morse ink-recorded tape. This is accomplished by photo-electronic scanning across the undulated ink-recorded tape determining as it scans where the inked lines begin and end.

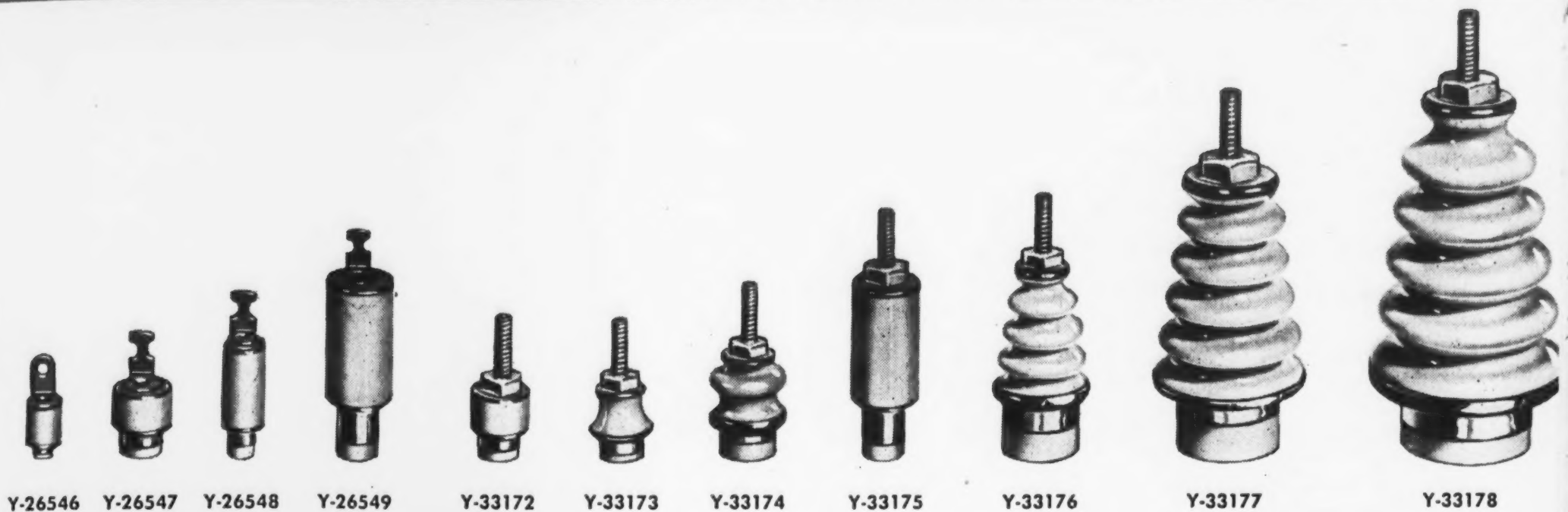
One of the unique functions of this electronic brain is the operation which handles the printed figure and letter groups as they are transmitted in Morse code. Morse code does not indicate when a figure group is being sent to permit the upper or lower case keys to operate for the printed figure or letter characters. Thus, the robot Morse operator, copying behind, determines that a figure group is being sent; it immediately generates its own pulse to the teleprinter advising it to go upper case, that a figure group is coming along.

Conversely, it does the same when, after a figure group has been trans-

(Continued on page 54)

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NEWS

mitted, it generates a letter pulse for the page printer to go lower case. In addition, the robot electronically and automatically advises the page printer carriage to return at the end of each line and automatically feed up a line for the next line of printed words.

The electronic converter cannot accept an input signal speed that is, on the average, faster than the average speed of the converter output signal. The new teleprinter high speed (600 wpm) reperforator lends itself quite readily to the application of a 600 wpm Morse signal output to the robot. However, at present the output speed is fixed, by most teleprinter systems, at 60 wpm.

CEP Helps Electronic Parts Contractors

There is a valuable aid available to contractors and manufacturers of Navy electronic equipments called the "Common Electronic Parts in the Electronic Supply System." Known as the CEP, it is published annually, with quarterly changes, by the Navy's Electronic Supply Office, Great Lakes, Illinois.

This publication is the definitive guide to parts which are considered common and therefore not to be purchased as equipment or stock spares, as automatic supply support is guaranteed by ESC within 60 days after notification by the contractor of their inclusion in an equipment.

The purpose of the CEP is three-fold. It is designed to reduce the burden of documentation on the contractor; to encourage contractors to use standard desirable parts in new equipments, and to increase the utilization of preferred items already in stock at Naval Supply Depots and Shipyards by increasing the applications for these items.

Specifically, the types of items included in the CEP are as follows:

a. All Armed Services Electro-Standards Agency (ASESA) preferred parts or Mil-Standard preferred parts which are used in Navy type electronic equipments and which are considered to be desirable continuing items in the Electronic Supply System.

b. All Joint Army-Navy and Military parts which are considered to be desirable continuing items in the ESS.

c. All Radio Frequency (RF) Index Parts which are, by technical determination, considered to be desirable continuing items in the ESS.

d. Commercial parts considered to be desirable continuing items in the ESS, provided they have current or

expected immediate application in the ESS.

Contractors or manufacturers supplying electronic equipments on a contract let by or through the Bureau of Ships may obtain a copy of the CEP by mailing a request giving the contract number to the Electronic Supply Office, Code 811, Great Lakes, Illinois.

POWER TRANSISTOR DEVELOPED BY WESTINGHOUSE

A combination of mounting and physical design has made possible the one-watt rating of a new germanium power transistor, now in pilot production by the Westinghouse Electronic Tube Division.

The black, ribbed surface provides cooling capacity for the one-watt collector dissipation rating. Additional cooling is accomplished by fastening the unit in thermal contact with the chassis.

The new pnp-type transistor (2N71) will be applicable to any low-frequency circuit, such as class A amplifiers, where output power is desired.

Texas Instruments Producing 5 Types of Silicon Transistors

Expansion of its line of silicon transistors from three to five types has been recently announced by Texas Instruments Incorporated, of Dallas, Texas. High volume production of the revolutionary new silicon transistor has made possible the addition of two more models to the line, one with an alpha (current amplification factor) of 0.975 or better and one with an alpha cutoff frequency of 8 megacycles or better.

Grown junction silicon transistors operate with little change at 150°C (302°F) compared to an equivalent limit of 65°C (149°F) for germanium transistors. Average alpha cutoff frequency is 3 m.c. for three of the types, with alpha guaranteed to be from 0.90 to 0.95 with Type 903, 0.95 to 0.975 with Type 904, and 0.975 or better with Type 905.

Type 904A has an alpha cutoff frequency of 8 m.c. or better and an alpha of 0.95 or better. The Type X-15 large signal unit gives a power gain of 14 db. with collector dissipation of 1 watt in Class B operation.

Hitemp Introduces Teflon Coated Hook-Up Wire

Expanded manufacturing facilities at Hitemp Wires Inc. of Long Island, New York have enabled the company to offer extruded teflon coated wire for high temperature service. The

first item produced is a stranded hook-up wire called Temprex.

Coated with a smooth Teflon sheath, Temprex is impervious to all known commercial solvents. Insulation remains unaffected by weathering, aging, fungus or moisture. It meets the rigid requirements of MIL Standard 104, and MIL-W-16878A for type E and EE constructions.

Ambient temperature from -90° to +260°C will not change electrical or physical characteristics of the wire.

The new wire is being made in a wide range of sizes. Fourteen standard colors are available for applications where wire identification is a problem.

Hooper Trophy for Excellence in Electronics

Approximately 125 Naval Reserve electronics divisions participated in the first nation-wide competition for the Hooper trophy for excellence in electronics training during the fiscal year 1954.

The winning division, determined by a point system, was Naval Reserve Electronics Division 8-12, Paris, Texas, which rose from third place in the Eighth Naval District competition in May to become the leader among all the electronics divisions in the nation. NRED 8-12, commanded by Cdr. Paul H. Daniels, USNR, had a final score of 104.2531.

Two other divisions in the Eighth Naval District, both located in Tyler, Texas, won second and third places: NRED 8-10 commanded by Lt. D. Hudson, Jr., USNR, took second place; NRED 8-14, commanded by Lt. W. J. Murdaugh, USNR, took third place.

Fourth prize went to NRED 12-6, Santa Rosa, California, commanded by Lt. Cdr. A. R. Butz, USNR.

(Continued on page 56)

The Hooper Trophy





When the going's tough, take to the air!

Logistics is not the only art in which the choice between ground and airborne transportation has to be made. The same problem raises its head in many a civilian situation, too—as simple a thing, perhaps, as long-distance telephoning.

Take the chap pictured above, for instance. He may not know it, but he is literally “on the air,” taking part in a radio show which is changing the face of the earth, squeezing it smaller.

Somewhere between him and the party to whom he’s talking are mountains and lakes over which ordinary telephone poles and wires could be installed only at prohibitive cost. So his local telephone company employs the modern magic

of *Microwave* to span distance and obstacles with a “pole-line in the sky”!

How does it work? Simply stated, the human voice is transformed into high-frequency radio signals, bounced from town to town over *any* kind of terrain and, at the desired terminating point, unscrambled and put back on wires as normal conversation.

America’s 5200 independent telephone companies get service like this from Stromberg-Carlson, which started facing and solving such problems over 60 years ago. We’ve also made a lot of similar contributions to national defense and will continue to make more.

There is nothing finer than a

Stromberg-Carlson[®] Rochester 3, New York

STROMBERG-CARLSON
LEADS TOO IN:



“Panoramic Vision”
Television
Receivers



Radios and
High Fidelity
Radio-Phonographs



Sound and
Public Address
Systems



Office
Intercom
Equipment



Electronic Carillons
for Churches and
Public Buildings

NEWS

The Hooper trophy was named in honor of Rear Admiral Stanford C. Hooper, USN (Ret.), in recognition of his outstanding efforts to encourage and promote electronics in the Navy. Admiral Hooper served as Director of Naval Communications from August 1928 until May 1935.

NEW BATTERY DEVELOPMENT

The Ray-O-Vac Company recently introduced a new King Size flashlight battery designed for extra-long life and to give extra power. This Ray-O-Vac 4-LP features a special polyethylene type protection, and is the newest battery advance developed by the company that has built more than 2 billion Leak Proof brand flashlight batteries.

Like all Ray-O-Vac Leak Proof brand batteries, the new King Size 4-LP features sealed-in-steel construction and is fully guaranteed against corroding your flashlight. This latest battery development fits any or all existing standard flashlights.

WIRE AND CABLE SYMPOSIUM

The Third Annual Wire and Cable Symposium jointly sponsored by the Signal Corps Engineering Laboratories, Fort Monmouth, and by the Wire and Cable Industry will be held December 7 through 9 at the Berkeley Carteret Hotel in Asbury Park, New Jersey.

A program is being arranged covering wire and cable materials, their characteristics and uses; wire and cable constructions, together with manufacturing and equipment problems; field construction methods; and uses in systems operation.

Companies and agencies interested in attending may obtain further details by contacting Mr. H. L. Kitts, Coles Signal Laboratory, Fort Monmouth, New Jersey.

60 Years of Progress at Stromberg-Carlson

(Continued from page 33)

through investment in a newly organized electronic firm known as Electronic Controls Systems, Inc., located in Los Angeles. This firm consists solely of a group of engineers who are undertaking development work in electronics, primarily in the fields of automatic process controls and data handling equipment.

In Rochester, the Electronics Engineering Department has recently moved into a new modern building with more than three times the space

VARIABLE TOROIDS NOW AVAILABLE

A new series of "Rotoroids"—variable toroidal inductors—provide a continuous three-to-one minimum inductance range with 180° shaft rotation. These hermetically sealed units employ a permeability tuning method, and require no DC saturating current. The choice of nominal inductance is virtually unlimited.

The manufacturer, Burnell & Company of Yonkers, New York, has announced that the presently available Rotoroids are electrically equivalent to standard toroids made by the company.

Army to Create Rank of Specialist

In a move designed to provide for the recognition of noncommissioned officers as persons of responsibility and authority, Army personnel in the top four enlisted grades will be separated into two groups, Noncommissioned Officers and Specialists.

Individuals in those grades serving as leaders or supervisors will retain their NCO status, while those who perform non-leadership duties of a technical or administrative nature will be designated "Specialists".

Specialists will have new distinctive insignia and will rank among themselves as Master Specialist (E-7), Specialist First Class (E-6), Specialist Second Class (E-5), and Specialist (E-4).

The new plan will become effective about January 1, 1955. Execution of the plan and the conversion of designated individuals in the top four enlisted grades to "Specialists" will be effected world-wide on the same day throughout the Army, including the Reserve components.

NCO's assigned to labor details will be used as supervisors only, while Master Specialists and Specialists First Class will normally be exempted from such duties in recogni-

previously assigned to this large and important group of research and development engineers, who devote their entire time to government projects. Several large buildings in Rochester have also been leased on a long-term basis, providing increased production and warehouse space. The most recent addition, of 150,000 square feet of space, is a large plant located within a block of the headquarters office and factory building on the main line of the New York Central Railroad. Total active manufacturing space in Rochester now totals 750,000 square feet.

Stromberg-Carlson, which started

tion of their technical or administrative skills and positions.

Electronic Equipment on Display at Heart Association Meeting

Over 2,000 physicians representing 48 countries met recently in Washington at the Second World Congress of Cardiology and 27th Scientific Sessions of the American Heart Association.

At this meeting, many electronic instruments designed specifically for cardiologists' use were exhibited.

Of particular interest was the Spectral Phonocardiography Machine designed to record, display and analyze cardiovascular sound in the three dimensions of time, intensity and frequency. While hearing the heart beat from the tape recording, the physician can also watch the procedure on the cathode ray tube. This machine, created by Dr. Victor A. McKusick of Johns Hopkins University, is composed of parts from many suppliers including: *Power Designs, Inc.*; *Kay Electric Co.*; *Krohn-Hite Instrument Co.*; *General Electric Company*; *Tektronic, Inc.*; and *the Heath Company*.

An instrument of special significance is the Cardiac Pacemaker which was developed by Dr. Paul M. Zoll of the Harvard Medical School and built by the *Electrodyne Company*. The Pacemaker brings into the heart an external electrical stimulation when needed at times of failures and seizures.

Other exhibitors of electronic equipment designed for medicine included: *Sanborn Company* which introduced a new four channel biophysical research recording system; *Statham Laboratories, Inc.* which exhibited pressure transducers; *Electronics for Medicine, Inc.*, specialists in custom built electronic equipment for the medical profession; *Edin Company Inc.*, makers of oscillograph recorders; *Raytheon Manufacturing Company* which demonstrated a new relief for asthma sufferers, the "Micronaire", and *Technicon Cardiograph Corp.* which introduced their new vectorscope, an automatic means for recording heart functions.

as a small company back in 1894, has enjoyed continued growth and success over the years. This success has been based on well-designed quality products, good management, and a unique pride of craftsmanship among its highly-skilled workers—many of whom have been with the company more than a quarter of a century. With a strong 60-year background of experience, Stromberg-Carlson looks forward with confidence to an even brighter future in its chosen fields of electronics and communications, where it has succeeded in doing well the things it knows how to do.



No one's going
to put
Salt on this
bird's tail!

It's enemy-proof . . . filled with power, speed, stamina!
And hidden away in the cockpit of this huge Flying
Cutlass are a thousand and one secret mechanisms . . .
every electronic protective device known to man. Many
of these devices were developed and produced by
Hallicrafters—a "primary producer" for the United
States Armed Forces.

see **h**ear see **h**allicrafters

4401 West Fifth Avenue, Chicago, Illinois

World's leading exclusive manufacturers
of communications radio

HALCRAFTERS FACILITIES ARE NOW BEING USED FOR THE DEVELOPMENT AND PRODUCTION OF: GUIDED MISSILE CONTROL EQUIPMENT
COMMUNICATIONS EQUIPMENT • COUNTERMEASURE • EQUIPMENT • COMBAT INFORMATION CENTER
HIGH FREQUENCY ELECTRONIC EQUIPMENT • MOBILE RADIO STATIONS • MOBILE RADIO
TELETYPE STATIONS • PORTABLE TWO-WAY COMMUNICATIONS EQUIPMENT • RADAR RECEIVERS
AND TRANSMITTERS (ALL FREQUENCIES) • RADAR EQUIPMENT

The Development of Ruggedized Electrical Indicating Instruments

(Continued from page 22)

Thirteen (13) meter manufacturers, virtually the entire industry, were awarded what are known as Industrial Preparedness Studies or IPS contracts. By means of these contracts it was expected to: (1) establish adequate production facilities, and (2) enable industry to formulate all necessary plans for shifting into mass production in the event of mobilization.

It was not required that each manufacturer produce a "Chinese copy" of the originally developed item. Technical information, samples and guidance were made available from the Signal Corps Engineering Laboratories so that each manufacturer would "product engineer" or tailor the developed item with a view to the optimum utilization of his own production techniques and plant. The end products would be tested in each plant in accordance with Signal Corps approved testing facilities and methods and certified by the contractor as meeting the specification requirements in every detail. In this manner each contractor would be free to utilize his own ingenuity and manufacturing skill to save production time, reduce costs or produce a superior product. The Services on the other hand would: be relieved of the tremendous testing load; benefit from possible advances or improvements effected over the original item by the various contractors, and be guaranteed the physical and functional interchangeability and adequacy of the various contractors' meters, in accordance with the specification requirements.

It is gratifying to note that this plan has worked out well in practice. Not only have adequate sources of

supply been established but also important improvements have been made over the original units developed. As a result of the program approved ruggedized meters are readily available in dc, ac, and rf types, from many manufacturers and in case sizes ranging from 1½" to 4½". Widespread use of these meters is being made and is anticipated in military and other equipments where reliability is important. By virtue of their almost unbelievable superiority over conventional types, supply and maintenance problems are greatly simplified, the need for replacements drastically curtailed, and unfailing performance under really rugged service conditions assured. In addition, thanks to the splendid co-operation of the concerned personnel in the Department of Defense, a three service MIL coordinated specification is being prepared.

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Acknowledgement is made of the extensive technical contribution of the Marion Electrical Instrument Company (contractor), the Barry Corporation, and the Tyer Rubber Company in connection with the original development. Many individuals in the Electrical Indicating Instrument Industry also cooperated with the Signal Corps and contributed generously of their time and experience in the expansion of the original development into an industry wide program. In addition, the success of the IPS and the coordinated specification planning phases are directly attributable to the interest and exemplary cooperation of the Department of Defense organizations listed below: Subpanel on Indicating Instruments and Meters, Research and Development Board; Components and Systems Laboratory, Wright Air Development Center; Bureau of Ships, Navy Department; Signal Corps Supply Agency and the Armed Services Electro-Standards Agency.

Integration of Communications

(Continued from page 27)

For instance, during fiscal 1955 the Navy's spending program includes:

- over \$1,000,000 for teletypewriter rentals and service,
- \$200,000 for facsimile services,
- almost \$400,000 for telegrams and radiograms,
- about a million and a quarter for telephone systems in the field,
- and around \$150,000 for weather and flight control services.

If your arithmetic has been rapid you will see that this totals slightly over three million dollars for commercial rapid communication services. It does not include research and development.

The Army and Air Force spend correspondingly considerable amounts for commercial services and use such services wherever it is feasible.

There is an effective and fundamental Department of Defense policy that the services make use of the country's commercial telephone facilities in distinction to government owned facilities except in specific instances.

Just to show that the Navy does not communicate exclusively by rapid means, during fiscal 1954 the Navy processed and handled more than 50 million pounds of mail, sold over \$600,000 worth of postage stamps, wrote postal money orders for over \$54,000,000 and collected \$500,000 in money order fees.

Through the "coordinating machinery" of the Joint Communications-Electronics Committee, and the Director, C-E,

of the JCS, much has been done to achieve the efficiency and economy claimed by the advocates of a merger to be possible only through a single communication service.

It is recognized by many experienced individuals (but by probably all too few) that there is a point of diminishing returns in complete merging of service communications. Beyond this point no further real economy may be obtained and, what is most important, the ability of each service to perform its assigned tasks and functions will be seriously impaired.

The services, through the Joint Communications-Electronics Committee, are endeavoring to find where greater integration of communications may be possible without the service commander's losing his "voice of command." As long as an Army commander has the responsibility for directing his forces, as long as the Air Force commander has the responsibility of carrying out specific missions, and the naval commander is assigned the job of keeping sea lanes open, each must be able to develop, plan for, and control his own communication system.

The three services are cooperating very successfully in the standardization of these components which they have in common, but still are of the opinion that a single service is unacceptable "because communications is a function of command and the services would be dependent upon a separate service for communication needs."

To attain the flexibility, concentration, or surprise necessary to win a war in this age a commander must be able—more than ever—to issue his orders reliably, securely, and directly, and with a speed commensurate with the need.

— — — — —

PERSONNEL CLEARING HOUSE

AFCA Members Available to Industry

The pages of **SIGNAL** are open to active AFCA members who are seeking positions in the communications, electronics and photographic industries. Any member is entitled to space free of charge in this column for three issues of the magazine. Please limit your notice to five lines. In replying, employers are asked to address: Box _____, **SIGNAL**, 1624 Eye Street, N. W., Washington 6, D. C. Letters will be forwarded to the AFCA member.

PERSONNEL & labor relations manager, supervisor, operational administrator; twelve years progressively responsible military and civilian experience. Extensive background in training procedures and communications equipment. Degree supplemented by advanced technical training. Prefer location in southeast. Box 103.

PURCHASING EXECUTIVE. Navy, Signal Corps and Air Force electronics background. Knowledge of contract administration, material control. Box 104.

MARINE CORPS VETERAN with B.E.E. degree desires position in systems design. Two years experience in plant testing and field installation of analog computers for naval fire control systems. Box 105.

CONTRACT ADMINISTRATOR. 8 years specialized, responsible experience in government procurement as former Section Head in Navy Dept. and with electronics manufacturer, handling contract administration, negotiations, quotations, redeterminations, renegotiation, etc. Box 106.

USAR SIGNAL CORPS MAJOR. Telecommunications specialist with 14 years military and civilian experience. Background also in personnel management, procurement and contracting. Fluent French linguist. Presently on mission in Europe. Seeks position as company's European technical representative or other responsible position in Europe, France preferably. Box 107.

Government and Military Positions Available

Government and military agencies are invited to use this column to announce available positions which may be of interest to the readers of **SIGNAL**. Notices will be published three times if not cancelled before. Applicants apply as indicated in individual notices.

RADIO OPERATOR TECHNICIANS. Veterans \$3400-\$4200 to start. Overseas opportunities. Amateur or commercial licenses helpful. Full pay during advance training. Good advancement opportunities. Submit resume with name, age, address, phone number—if any, military experience, private training, work experience, FCC licenses—if any. Armed Forces Communications Association will forward same immediately to employer who will acknowledge your application direct.

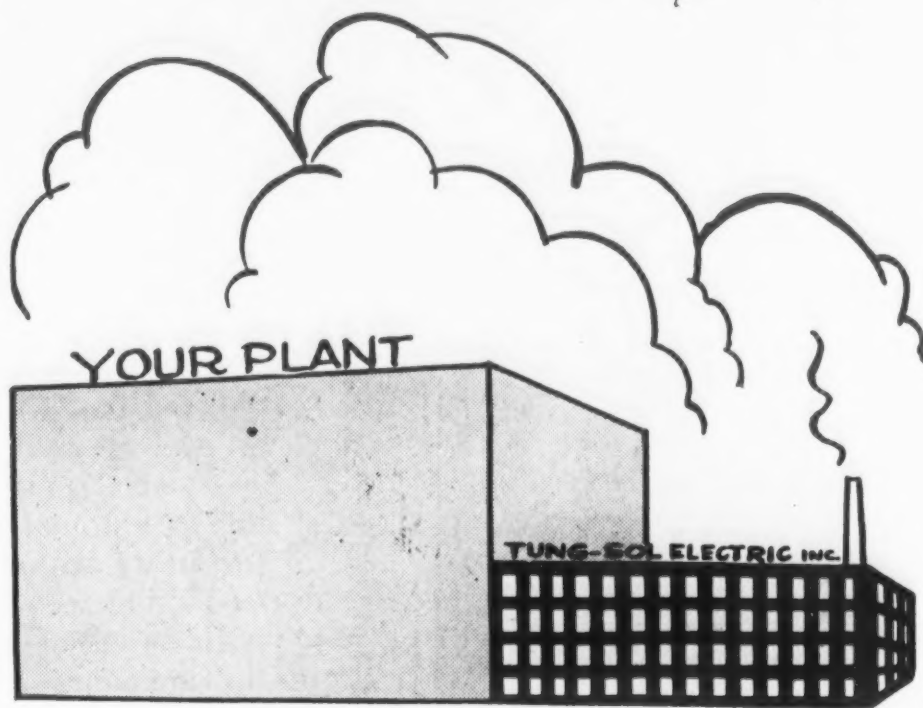
TELETYPE OPERATORS AND CRYPTOGRAPHIC TECHNICIANS. Veterans \$3200-\$3700 to start. Overseas opportunities. Full pay during training period. Good advancement opportunities. Submit resume with name, age, address, phone number—if any, military experience, FCC licenses—if any. Armed Forces Communications Association will forward same immediately to employer who will acknowledge your application direct.

Applications are requested for electronic, aeronautical, mechanical, industrial engineering, editorial and photography positions located at the U. S. Naval Air Missile Test Center, Point Mugu, Port Hueneme, California. Applications, and requests for the complete Vacancy List of 39 available positions with salaries ranging from GS-5 to GS-13, should be addressed to: Mr. R. A. Riebow, Employment Superintendent, U. S. Naval Air Missile Test Center, Point Mugu, Port Hueneme, California. Some of the positions are:

ELECTRONIC ENGINEER, GS-13, to be Systems Development Engineer in the Office of the Senior Development Engineer, Range Instrumentation Department, NAMTC. Will accept personal responsibility for developing new or improved electronic systems for trajectory measurement in the Sea Test Range and associated data-reduction facility.

ELECTRONIC OR AERONAUTICAL ENGINEER, GS-9, for Sparrow III Division, Missile Test Department, NAMTC to prepare detailed test plans for conduct of ground and flight tests of missile systems in accordance with established overall test plans including timing of events, communications, flight paths, telemetering and photographic coverage.

THE SPECIAL DEVICES CENTER, Office of Naval Research, located 25 miles from New York City at Port Washington, Long Island, needs electronic and aeronautical engineers. Applicants must possess degrees in engineering, and pertinent electronic or aeronautical engineering experience. Apply to Mr. David A. Lana, Industrial Relations Dept., Special Devices Center, Office of Naval Research, Port Washington, N. Y.

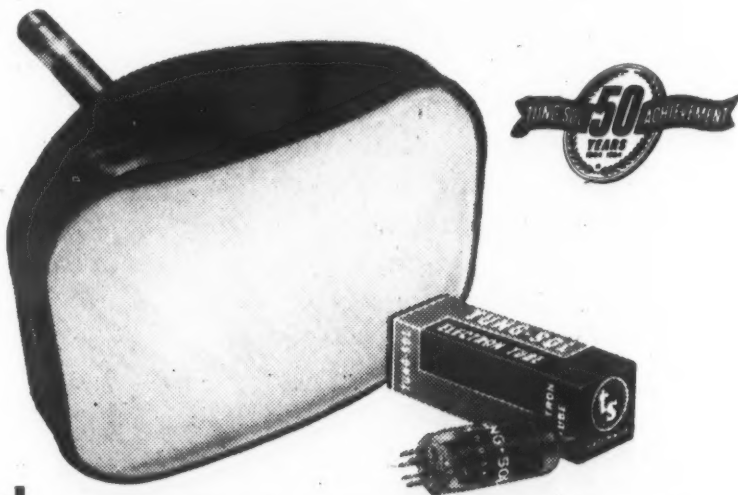


*Our plant
becomes an
extension
of your plant*

Our engineering and manufacturing facilities can make our plant a vital extension of your plant. We make nothing but electron tubes—no sets—no equipment. We are completely independent, so we are in a position to keep your plans in strict confidence—to work with you with as much loyalty and secrecy as if we were in your own organization.

TUNG-SOL ELECTRIC INC.
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Sales offices: Atlanta, Chicago, Columbus, Culver City (Los Angeles), Dallas, Denver, Detroit, Newark, Seattle.



Tung-Sol makes All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes and Semiconductor Products.

TELEVISION



Admiral employee is holding bottom side of printed circuit section showing soldered connections (left) and top side with parts (right).

AUTOMATICALLY ASSEMBLED PRINTED CIRCUITS FOR TV

Admiral Corporation has recently announced the development and use of revolutionary high speed robot machines that automatically assemble printed circuits equivalent to approximately one-half of a television chassis in a matter of seconds.

It has been predicted by Admiral executive vice president, John B. Huarisa, that this mechanized television production line will eventually have the same effect on the electronics industry that Henry Ford's moving chassis assembly line methods had on the automotive industry over 40 years ago.

The company has built and installed a 30-foot long battery of complex machines into which electrical components such as resistors and wire jumpers are automatically fed and from which is delivered a completely assembled printed circuit board in a few seconds.

In operation, the robot machines utilize printed circuit boards which are photo-etched and stamped in one of Admiral's 12 plants. Stacked boards are automatically moved from machine to machine for a speedy trip down the 30-foot line.

Fifty assorted resistors and wire jumpers are automatically inserted in the board, some singly, some two at a time and some three at a time. Before inserting the resistors, the robot machines trim the wire leads to

size, then crimp them precisely to contact the copper circuit pattern.

The Admiral equipment is so constructed that whenever any part fails to feed from the chute, a red light goes on at that machine. The entire line is automatically halted until adjustments are made and the components again feed smoothly.

Eventually, Admiral officials say, the machines will be able to insert complex items such as tube sockets and tubes.

Admiral lists some of the advantages of a printed robot chassis as: more uniform production, trouble-free soldering, greater resistance to extremes of temperature and humidity, more flexibility of engineering and lower production costs.

New TV Transformers from Triad

Five new correct replacement fly-back transformers have recently been added to the television replacement line of Triad Transformer Corporation, Venice, California.

All units are ruggedized versions of original equipment and are electrically and mechanically interchangeable with the manufacturer's original equipment. Three units are designed for use in Admiral receivers; two for use in Emerson receivers.

Model numbers and chassis for which the new transformers are suitable are listed in Triad Television Replacement Guide TV-54, copies of which may be obtained by writing to the company.

Three Major Advances in Color TV Demonstrated by RCA

Three new major developments in color television were demonstrated recently by the Radio Corporation of America, opening the way to early mass production of color television sets at costs within the reach of the consumer.

Described as milestones in the march toward commercial color television, the three new developments were:

1. A new 21-inch RCA-color picture tube with 250 square inches of viewing area—22% more than any other color tube yet produced.

2. A magnetic field equalizer called the "Color Equalizer." This new invention guarantees improved

color set performance and makes possible a reduction in manufacturing costs.

3. A new, simplified color television receiver, which reduces circuitry by one-third and enables a substantial reduction in production costs.

At a special press showing, which preceded demonstrations for representatives of industry, Dr. Elmer W. Engstrom, Executive Vice-President, RCA Research and Engineering said: "This new receiver is the result of our experience with the 15-inch RCA color set, and of lengthy trials by our engineers of many forms of simplified circuitry."

The new receiver uses 28 tubes, including the picture tube, and draws less than 300 watts from the power line, as compared with the first large-scale black-and-white set produced by RCA which used 30 tubes and drew about 300 watts.

This simplified receiver covers all TV channels—both UHF and VHF.

FIRST AIR FORCE OVERSEAS TELEVISION STATION

Completion of plans for the first Air Force overseas television station has been announced by Lt. Gen. Joseph Smith, Commander, Military Air Transport Service.

Lajes Field, Azores, has been chosen by MATS as the proving ground for Air Force television because of its isolated location. Official broadcasting on the 50-watt station began October 17.

The Azores television station will be the first of a series of similar TV operations to be set up by MATS in various parts of the world.

MATS television stations will relay both educational and informational material to troops, but they will also telecast kinescope recordings of the top stateside programs of the big four networks.

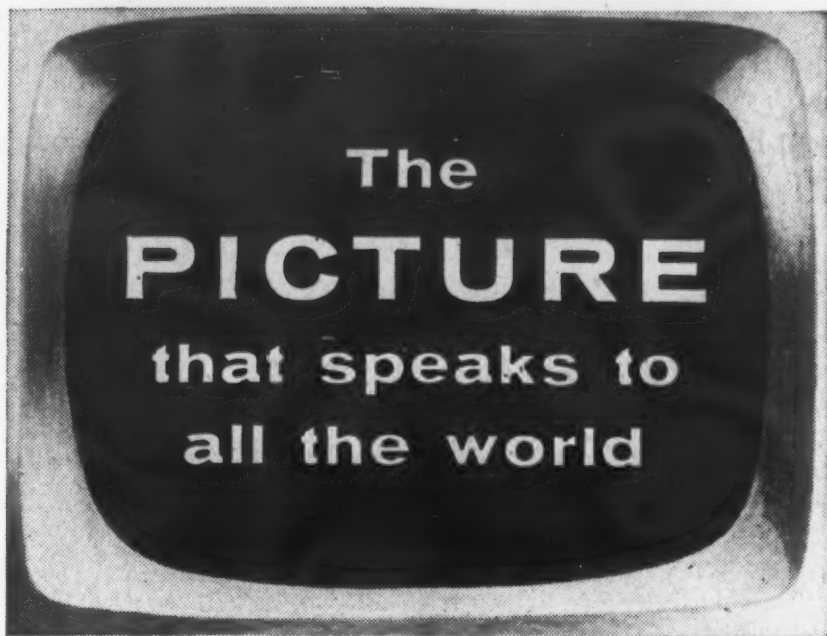
Picture Tube Tester Announced by Boland & Boyce

A new picture tube and television receiver tester that tests all magnetically deflected black-and-white or color tubes under actual receiving conditions has been announced recently by Boland & Boyce, Inc., Belleville, New Jersey.

Known as the B&B Model-701 Picture Tube Tester, the new instrument is available through radio parts jobbers either in kit form or factory wired and tested ready to use.

In operation, the socket is disconnected from the base of the picture tube and inserted into the B&B Tester

(Continued on page 62)



Only 23 years ago modern all-electronic television was made possible by Dr. Allen B. DuMont's development of the cathode-ray tube. Now the television picture "speaks in tongues" to all the world. It is the fastest-growing form of communications...with tremendous possibilities for better understanding between men and nations.

And still the vision of DuMont looks ahead, to bring ever-better television to more and more people!

Today DuMont-installed stations, DuMont transmitters and telecasting equipment are

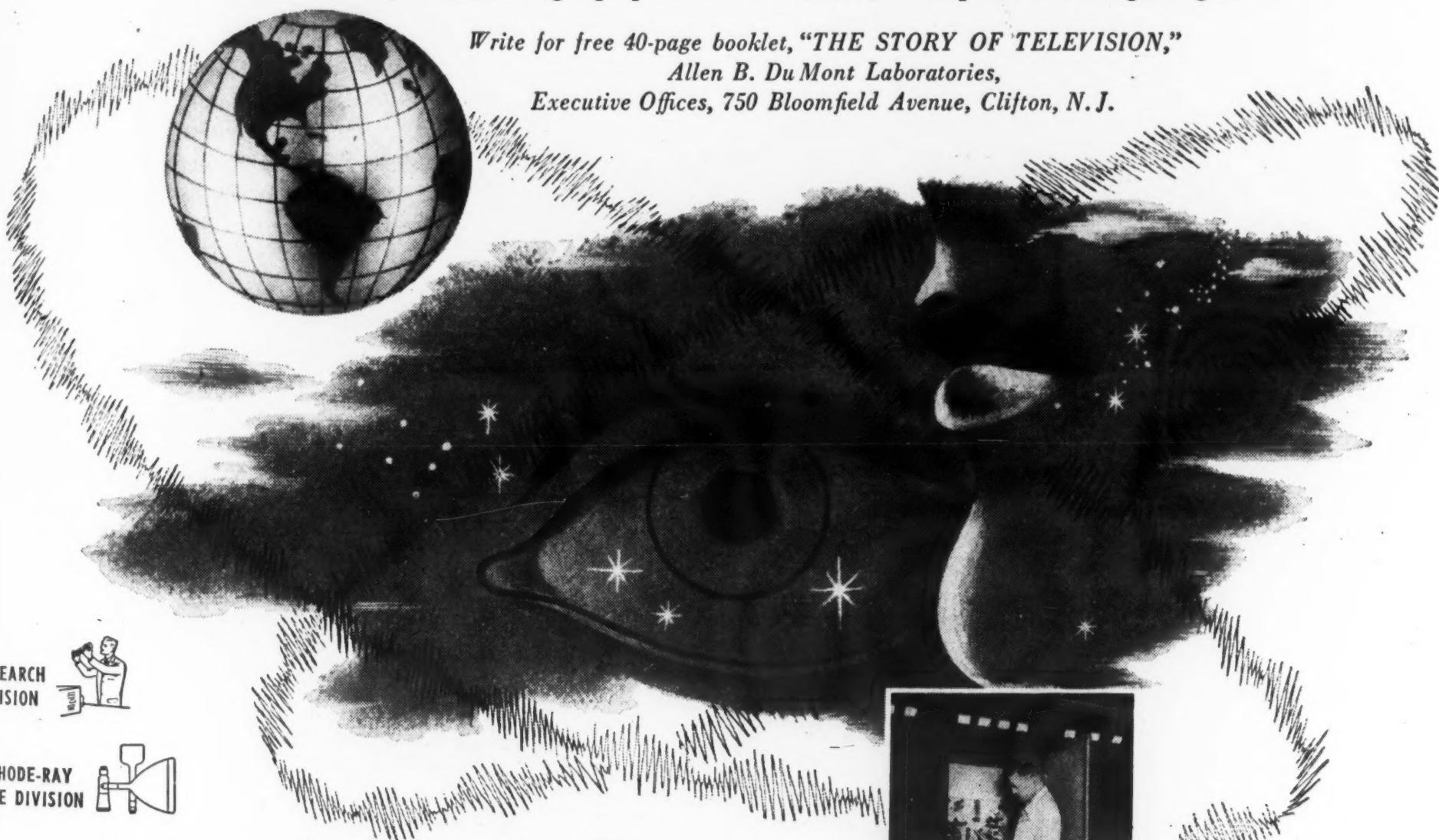
serving from Alaska to Argentina, across the Pacific and around the globe. New powerful low-cost DuMont transmitters bring practical television to vast areas. Farsighted DuMont design permits stations everywhere to expand economically as their audiences multiply.

In other fields of communications, too, DuMont electronic engineering continues to speed progress. Industrial television has been greatly advanced by DuMont. Radar and loran for national defense...originally developed from pioneer DuMont discoveries...are continuously improved by new DuMont contributions. Mobile radio communications for police and fire departments and for military use are made better by DuMont skill and knowledge.

Every step ahead in communications means better living for the world. And so DuMont vision works around the clock, across the calendar, to help the world "get together!"

Write for free 40-page booklet, "THE STORY OF TELEVISION,"

Allen B. DuMont Laboratories,
Executive Offices, 750 Bloomfield Avenue, Clifton, N. J.



RESEARCH
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BROADCASTING
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VISION IS THE **DU MONT**® DIMENSION

First with the Finest in Television



DU MONT TRANSMITTERS, STATION AND MOBILE EQUIPMENT
are extending better, more economical communications around the world.

TELEVISION

by means of a cabled adapter cord. A second adapter cord connects between meter and picture tube. With the receiver turned on, accurate measurements are rapidly made of the current and voltages applied to any tube element.

Quantitative and qualitative tests of video signal output voltages, receiver contrasts and brightness controls, receiver alignment, and the effectiveness of the antenna system can all be made merely by turning the eight-position switch on the instrument's front panel.

WGBH-TV Receives Microwave Relay Gift from Raytheon

An invisible electronic link between WGBH-TV studios in Cambridge, Massachusetts and its transmitter, 10 miles away, has just been donated by the Raytheon Manufacturing Company of Waltham, Massachusetts.

WGBH-TV engineers already are preparing to install the new microwave relay equipment, the KTR-100, on the roof of the station studios.

The KTR-100 is a small microwave relay which picks up the sound and picture recorded by television cameras and microphones and flings both through the atmosphere at the same time without wires or cables.

Although the KTR-100 is light enough to carry by hand in its metal "suitcases," it will be mounted permanently on a steel pedestal above WGBH-TV studios.

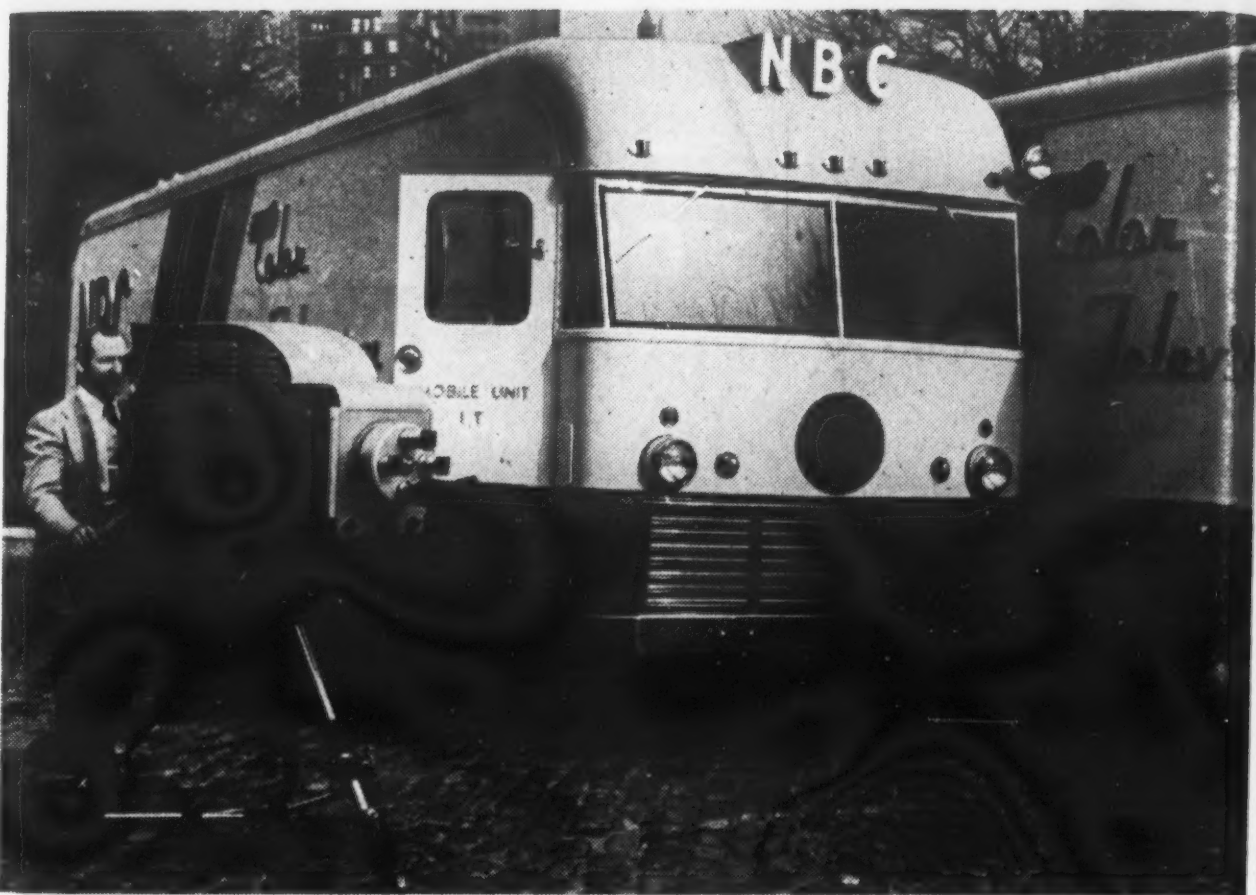
The sight and sound are transmitted and received at each end of the 10-mile path by a four-foot "dish" or aluminum reflector. The transmission from studio to transformer cannot be interrupted by hurricanes or ice storms. After a program has been received by the "dish," it is then sent out through the WGBH-TV transmitter over its 849-foot high antenna.

Solderless Coaxial Cable Connector

A new coaxial cable connector, now available from Entron, Inc. of Bladensburg, Maryland, offers several outstanding features which recommend its incorporation in communications and television equipment.

Of particular interest to designers is its electrical reliability, high mechanical strength and effective shielding, the latter obtained by a radial grounding contact.

Quickly and easily installed, and completely solderless, it offers time-saving efficiency as a principal feature.



Designed by NBC engineers and fitted with RCA equipment, this color mobile unit has been touring America. It can generate its own electrical power and transmit signals with its own radio relay system, permitting it to operate many miles from the nearest network line.

Ceramic Capacitor for Color TV from Sprague

A new high voltage ceramic capacitor with integral corona shield is being used in early model color television receivers.

This capacitor, rated at 500 mmf, 30,000V, is part of a new series of high voltage ceramics developed especially for color television applications by the Sprague Electric Company, North Adams, Massachusetts. Mechanical configuration of this new unit resembles a child's toy "top" in appearance.

COLOR TELEVISION CARAVAN TOURS NATION

A "color television caravan" completely equipped to produce on-the-spot programs to introduce color television to audiences at fairs, expositions and other large public gatherings, has been constructed by RCA.

This unit made its public debut during September at the Mid-South Fair, Memphis, Tennessee. In addition to fairs and expositions, the RCA unit will also be available to conventions, and business and service organizations.

Heart of the RCA color television caravan is a specially designed 32-foot streamlined trailer. It contains a complete control room and technical equipment to originate any type of program, "live" or film. Other equipment included is a quantity of RCA Victor color television receivers, two RCA color TV cameras, a color television film-scanner and microwave apparatus.

A complete staff, including engineers, technicians, and program production experts, has been assigned to the color caravan. Unique in the equipment carried by the mobile unit is a color television projector showing color programs on a 15 x 20 foot screen.

In most instances, this unit will originate programs which will be carried over a closed circuit to color receivers via cables. The color caravan is also equipped to "feed" color signals to a commercial television station or to a network.

Conference on Military Training by Television

A two-day conference on the subject of "Military Training by Television" was held at the Signal Corps Training Center, Camp Gordon, Georgia, during September. Commandants from 20 Army technical schools were invited to attend.

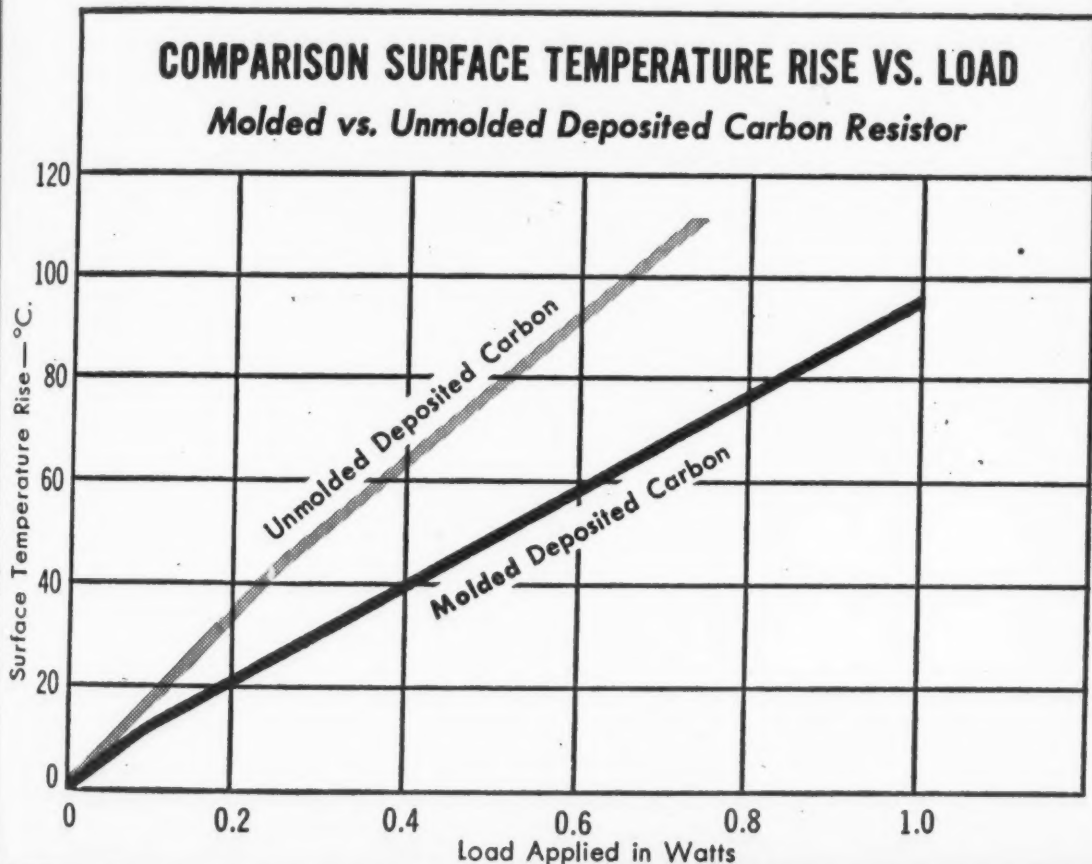
Following closely on the heels of the Army's coast-to-coast telecast demonstrating the use of television in tactical combat operations (*Signal*, September-October 1954), the seminar dealt with television as a training and instructional medium.

The Television Branch of the Southeastern Signal School has been in operation since November 1952 when it began operations with four hours of televised instruction per week. Today, over a closed microwave and coaxial cable circuit connecting several separate classrooms to the studio, 34 hours of instruction are being given weekly.

NOW

a molded deposited carbon resistor

The added advantages of *molded* insulation are now available for 1/2 Watt Deposited Carbon Resistors. New Type MDC is a 1% precision film resistor combining high stability, small size and low cost. The molded plastic housing provides complete mechanical protection, minimizes the effect of moisture and improves load life characteristics.



Improved Load Life Characteristics with MDC



**Better Insulation Resistance
Better Moisture Characteristics**



Complete Mechanical Protection With Molded MDC

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INTERNATIONAL RESISTANCE CO.

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Send Technical Bulletin B-9 describing Molded Deposited Carbon Resistors:

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Military



Radio

Amateurs



MAJOR FLINT ASSIGNED CHIEF, MARS (ARMY)

Major Willard Flint (A4BNY), Signal Corps, has been assigned Chief, Military Affiliate Radio System (Army) with headquarters in Washington, D. C. Major Flint previously was assigned in the Communications Planning Branch of Army Communications Service Division, Office of the Chief Signal Officer.

The new MARS Chief is a licensed amateur radio operator and a member of the American Radio Relay League. His present amateur call is W4BNY; he is also custodian of Station K4USA, located on the concourse of the Pentagon Building, Washington, D. C.

Major Flint served during World War II as a Signal Liaison Officer with the Chinese Army. Assignments since the war have included such diverse duty as Signal Corps ROTC Instructor at Oklahoma A. and M. College, and Signal Corps Liaison Officer with the Turkish Army, with headquarters at Ankara, Turkey.

Major Flint also will serve as Secretary of the MARS Advisory Committee, a policy recommending body with representation from the Armed Services, Federal Communications Commission, Federal Civil Defense Administration, American National Red Cross and the American Radio Relay League.

Captain Joseph Fischler, who had been serving as Acting Chief of Army MARS (see September-October SIGNAL), is now at the Department of the Army Transmitting Station.

New SSB Filter From Burnell

Burnell & Co., Inc. manufacturers of toroidal coils and filters for commercial and amateur communications equipment, have announced the availability of a new upper single side band filter, the S-16000.

A companion piece to the previously announced S-15000 SSB filter, which has already won wide acceptance for converting equipment to lower SSB operation, the S-16000 is designed for



Maj. Willard Flint, new Chief, MARS (Army), inspects transmission tape of President Eisenhower's United Nations Day message prior to its transmission from Army and Air Force joint MARS station at the Pentagon.

use in applications where upper side band operation is preferred.

It may be installed in any existing amateur receiver or in a new design. It can also be used for reception not only of SSB but of regular AM signals.

The new filter utilizes toroidal coils of high Q instead of the costly crystal elements formerly required, to provide a narrow-band, sharp cut-off response which insures maximum intelligibility and maximum signal strength.

These filters are designed to be used in a 50-kc second i.f. amplifier. With normal tuning, side bands as much as 3000 cps above the carrier are passed with not more than 3 db attenuation. The carrier is attenuated 15 db, and the side bands 200 cps or more below the carrier are attenuated at least 30 db.

New Communications Receiver By Hammarlund

A completely new professional and amateur communications receiver incorporating such advance features as a continuously calibrated bandspread and a novel sectionalized construction has been introduced by the Hammarlund Manufacturing Company.

The receiver's precision differential tuning system, a marriage between mechanical and electrical bandspread, makes it possible to read the exact

frequency to which the receiver is set anywhere from 550 kilocycles to 35.5 megacycles. The rotary turret construction for selecting any one of the six bands, of the type found in the Super Pro-600 receiver, permits extremely short leads between the circuits and tubes, and makes possible the separate removal of individual circuit sections.

The set is double conversion from 2.2 to 35.5 megacycles, its top four bands, for high image rejection. High stability is achieved because of the crystal-controlled second conversion oscillator. Improved front-end selectivity is obtained with the modern, single tube, triple-tuned RF section. Besides the normal BFO level, an extra high level BFO has been incorporated for single sideband reception.

The slant panel with wrist high placement of the tuning knobs is a new achievement in coordinated grouping of controls. The receiver is available in either a black cabinet with gold-color trim, or gray cabinet with black knobs and silver-color trim.

ARRL Holds Annual Simulated Emergency Test

The ability of American and Canadian amateur radio operators to handle emergency communications in time of disaster was tested during October when the American Radio Relay League held its annual Simulated Emergency Test.

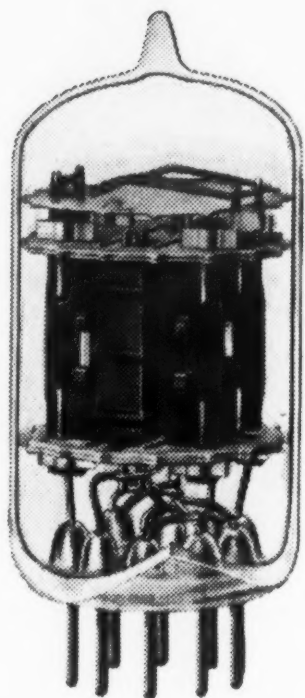
The ARRL's local Emergency Coordinators in hundreds of cities and towns prepared mock disaster problems such as a simulated air raid, flood, fire, or storm. The members of local groups did not know what the exact nature of the test was to be, nor at what time it would "happen" until they were alerted by the Coordinator.

At the alert, individual hams manned mobile, portable, and home radio stations, set up liaison with local Civil Defense, and Red Cross authorities, and formed emergency networks, just as they had done in real disasters like the New England

(Continued on page 70, col. 2)

In G-E 5-Star Tubes—

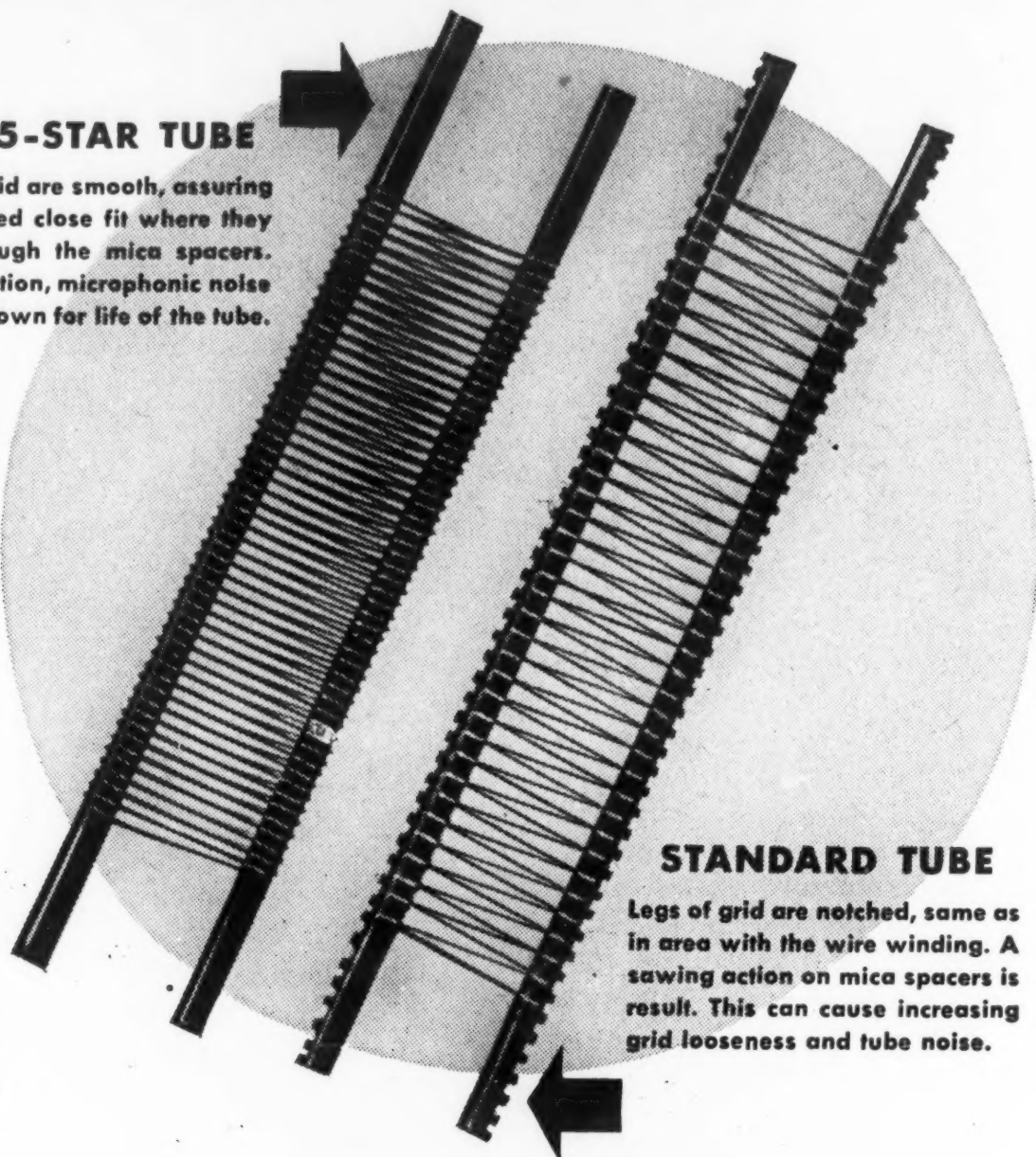
SMOOTH, TIGHT-FITTING GRID LEGS CUT MICROPHONIC NOISE!



G-E 5-Star Tube, shown approx
1½ times actual size

G-E 5-STAR TUBE

Legs of grid are smooth, assuring a continued close fit where they pass through the mica spacers. Grid vibration, microphonic noise are kept down for life of the tube.



STANDARD TUBE

Legs of grid are notched, same as in area with the wire winding. A sawing action on mica spacers is result. This can cause increasing grid looseness and tube noise.

VIBRATION—an accepted hazard for military electronic equipment—often makes the grids of standard tubes loosen in their micas. Internal tube spacings are affected, and the tubes grow increasingly noisy. Field replacements run high.

Special design of G-E 5-Star Tubes corrects this cause of microphonics. Smooth 5-Star grid legs fit tightly in their spacers; will not loosen from vibration or shocks. Result: tube replacements seldom are needed, and communications or other equipment keeps operating on a no-time-out basis.

Designed . . . built . . . tested for high reliability, G-E 5-Star Tubes keep your electronic-maintenance needs low. Ask for 5-Star Tubes in new equipment! Install them as replacements! Interchange list will be mailed on request. Write *General Electric Company, Tube Department, Schenectady 5, New York.*

Nominate a candidate for the Third Annual Edison Award for radio amateurs! Help honor outstanding public service! Entries close January 3, 1955. Write G-E Tube Department for the rules!

G-E 5-Star Tubes are the most reliable you can install!

Among their many design features are:

- Double mica spacers at both top and bottom brace the internal structure, and enlarge the surfaces in contact with the glass envelope. Result: greater resistance to shocks and vibration.
- To give 5-Star Tubes increased strength, the tube cage is shorter and sturdier and the cathode has been made larger in diameter.
- Getter is double-staked to provide firm connection and support.
- Heater bends are specially coated a second time, to assure uniform insulation and prevent "shorts".
- A getter flash shield keeps conductive deposits off the mica spacers, in tubes where plate-grid leakage must be held to a minimum. Special slots in the spacers further decrease leakage.
- Critical grids are gold or silver-plated to minimize grid emission.

GENERAL  ELECTRIC

164-1AG

PHOTOGRAPHY

NEW PROCESS TO MINIMIZE SCRATCHES ON FILM

A new process to minimize the injurious effects of scratches, dust or oily fingerprints on 35mm negatives has been developed by the General Electric Company.

The new process, called Refractasil, utilizes silicone oil and is used in a specially devised film holder or carrier attached to a photographic enlarger. This new liquid, together with the film holder, will be on the market in a few months.

In developing this process, General Electric found through analysis of film scratches that most of the troublesome damage occurs in the film base or in the gelatine overcoat rather than in the silver image between.

It was therefore reasoned that it might be possible to find a very special liquid that would come close to matching the physical and optical properties of film. Silicone oil was the liquid chosen since it is nearly water-white, nontoxic, inert to film and emulsion and possesses just the right vapor pressure—neither so low that it will not evaporate promptly when wiped off, nor so high that it vaporizes too quickly while in use.

Fairchild Polaroid Oscilloscope Camera Introduced

Another advance in oscilloscope photography has been announced by Fairchild Camera and Instrument Corporation with the introduction of its Special 1:1 FPO Polaroid Oscilloscope Camera.

This new camera is a special Fairchild adaption of the Polaroid-Land principle of a "photographic print in one minute". It delivers a permanent photographically accurate record of single transients or identical repetitive phenomena that appear on the C-R tube in the shortest possible time after they have occurred.

It is the only unit available on the market today having the facility to record phenomena from a 5-inch cathode tube at a 1:1 ratio on Polaroid-Land film.

Some of the applications of the new design include sonic analysis, television signal certification and television transmission quality control in addition to conventional uses.

Because of the speed with which photographic prints are made available to the engineer or technician, laboratory work can proceed without interruption or long waiting periods, which are necessary when conventional film is used. The engineer can, if necessary, make changes and adjustments in the apparatus under study, without delay.

For quick and easy evaluation, a grid may be recorded directly on the print, or if no grid is recorded, one may be laid over the finished print as the image is life size.

The camera is equipped with a 75mm f/1.9 Wollensak Oscilloanastigmat with a No. 3 Alphax shutter having speeds of 1 second to 1/100 second, time and bulb. Print area is 3 by 4 inches.

Available accessories include a Wollensak Opal filter for presolarization of the film; a round base bezel which can be adapted to most oscilloscopes having bezels larger than 5 $\frac{5}{8}$ inches O.D. or those having bezels too small to be fitted by means of a gasket; and a square base bezel for use on oscilloscopes having no bezel and provided with a square filter and grid holder.

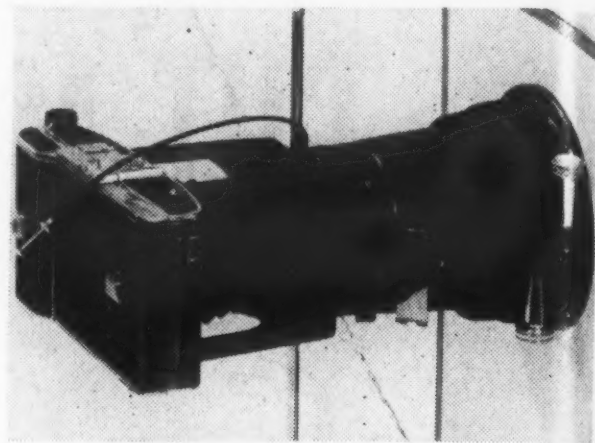
Ampex Stereophonic Sound Systems For Army & Air Force Theaters

The Ampex Corporation has recently announced the completion of its first contract to furnish stereophonic CinemaScope sound systems for the Army and Air Force Motion Picture Service.

Under this contract, Ampex supplied complete sound systems to 104 military post theaters throughout the world.

Equipment supplied to the military posts, many of which are far from commercial service facilities, was of the Ampex deluxe type which can maintain stereophonic sound reproduction even under such emergency conditions as tube burnouts.

The systems were specially modified by Ampex so that existing amplifiers, used with optical sound tracks, could be removed from the crowded projection booths found in many post theaters. Provision was made so that a high-fidelity Ampex amplifier could be used even with optical sound tracks.



Fairchild Polaroid Oscilloscope Camera

ULTRASONIC PHOTOGRAPHIC DEVICE FOR MEDICINE

A new photographic device which may supplement x-ray and fluroscope in clinical diagnosis has been developed by Douglass H. Howry of the University of Colorado Medical School.

Termed the Somascope, it combines some principles of sonar, radar and television. The device is claimed to produce well-defined pictures of cancer and the body's internal soft organs and tissues.

In operation, a beam of ultra-high frequency sound 1/16 of an inch wide, is swept across the area under investigation and the echoes are recorded on a television screen and photographed there.

Two Slide Projectors From Eastman Kodak

Two new slide projectors, the Signet 500 Model 1 and the Signet 500, have been announced recently by Eastman Kodak Company of Rochester, New York.

The new projectors are designed respectively for showing both single-frame film strips and 2" x 2" slides not only for home projection, but for showing before large groups by schools, business and civic organizations.

In Model 1, a new semi-automatic take-up slide changer feeds slides singly from the top, thus eliminating jarring of the machine and unintentional repetition of pictures. After each projection, each slide is automatically fed into a receiving box, which holds up to 22 slides. The projector is equipped with either an f/3.5 or an f/2.8 Kodak Ektanon Lens.

(Continued on page 68)



Newest advance in railroading...

ERIE'S *Radio-Equipped* Main Line!

Erie Railroad's *Main Line*—all of it—is now equipped with *Farnsworth* radio. In clear or foul weather, orders and information can be transmitted—linking cab and caboose...moving trains...dispatchers...wayside stations...even crewmen on foot.

This is the most extensive and comprehensive main line radio-telephone communication system ever installed. Its coverage is complete—providing full radio communication between trains and wayside stations, New York to Chicago, as well as in yards and terminals. All equipment was engineered and manufactured by a Division of International Telephone and Telegraph Corporation. Comprehensive, practical, fully-proven radio systems are now available to meet the exacting requirements of America's railroads.

ITT



INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION, NEW YORK, N. Y.

For information on "*Farnsworth*" railway radio communications, address *Federal Telephone and Radio Company*, Clifton, N. J.

The Signet 500 is designed along the same lines as the Signet 500 Model 1 and is also for showing both single-frame film strips and 2" x 2" slides to large and small groups.

Conversion from one use to the other can be accomplished quickly and easily since it is only a matter of loosening a screw to interchange the film strip adapter and slide-feeding mechanism.

The image portion of the strip is untouched as it moves through the projector. Gear pressure plates hold the film firmly but separately before it is advanced to keep the strips scratch-free.

The projector features the same lenses as the Signet 500 Model 1.

ANSCO AND KODAK ISSUE NEW BOOKLETS

Anso's 80-page book, "Anso Films for Black-and-White Photography" is now available in a new, revised edition, containing the latest technical data. This fully illustrated reference book for both professional and amateur photographers contains a wealth of useful and necessary technical and general information.

It includes complete data on all Anso roll, pack, sheet and 35mm films for black-and-white still photography. It also contains exposure and processing recommendations, filter factors, time-gamma and time-temperature curves and similar information.

For Other Scientific Fields

A new 16-page publication of the Eastman Kodak Company has recently been issued, summarizing the characteristics of Kodak films, plates, pellicles, filters, and wedges for scientific and laboratory work.

The line of materials covered are not only for general photographers, but also for the microscopist, the spectrographer, the astronomer and the nuclear physicist. Workers in these fields will find a complete listing of the products applicable to their activity and in addition should find the booklet of value for reference since it contains many technical notes covering the products offered.

Micro-Twin Portable Microfilming Machine Available

A new low-cost microfilming machine for office use which combines recording and reading in one compact, portable unit has been announced by Burroughs Corp., & Bell & Howell Co.

Called the micro-twin the new microfilming machine will combine all microfilming into a single table-top

size unit. Controls have been simplified and an experienced person can learn to operate the unit with only a few minutes of instruction.

The Micro-Twin unit will record documents smaller than bank checks up to single sheets 11 inches wide and 3700 feet long, photographing both sides. A system of mirrors is used to record the face and reverse sides at the same time. The unit is so light it may be carried easily by two persons. It has a rugged lightweight aluminum channel frame covered with plywood. It measures 13½" high by 23" deep by 32" wide. The reader screen is size 8" x 11".



New Auricon Camera Plant Completed

Berndt-Bach, Inc., manufacturer and world-wide distributor of Auricon 16mm sound-on-film cameras and equipment since 1931, has announced the completion of a new and modern plant in Hollywood, California.

New office and plant facilities were especially planned by Berndt-Bach for efficient design, development and production of high-quality, precision motion-picture cameras and kinescope recording equipment for the film and television industries. Special facilities have been provided for research and development of natural-color film equipment for television, film studio, and educational use.

Chec-A-Shutter Electronic Shutter Tester

A new shutter tester, the Chec-a-Shutter, based on electronic principles has been developed by W.B.A. of Los Angeles, Calif. The basic circuit of the tester consists of a light sensitive pick-up, an amplifier, a clipper, a double integration network which slows down the movement of the meter and at the same time forms the time constant network and an unconventional vacuum tube voltmeter.

The unit uses a transformer type

power supply and the high voltage circuit is voltage regulated making the unit immune to live voltage changes. Chec-a-Shutter is an entirely self-contained unit with the exception of the light source. The unit may be used to check synchronization of both between-the-lens and focal plane type shutters. The tester is 15" x 9" x 7" and weighs 20 pounds.

The Motion Picture As a Scientific Aid Discussed

From the Industrial Bulletin of Arthur D. Little, Inc. comes news of the increasing usefulness of the motion picture camera in showing the scientist far more than appears to the unaided eye.

The camera not only records, but can be coupled with the fluoroscope, x-ray machine, microscope, or other optical equipment. It can speed up motion or slow it down, respond to radiation beyond either end of the visible spectrum, surmount fatigue, and operate where a human observer could not survive.

Ultra-slow-motion pictures are particularly prolific of hitherto inaccessible or unsuspected data. Analyzing industrial motion problems may require camera speeds of at least 120 frames per second. Each frame exposure may be made with a high-intensity light flash of extremely short duration. Recent experimental cameras have speeds up to 100,000 frames per second, with one reported to handle 10 million frames.

This high-speed photography has helped the telephone apparatus industry cut operating time for dial-system switches. Bell System research units make and study up to 800 reels of high-speed film annually.

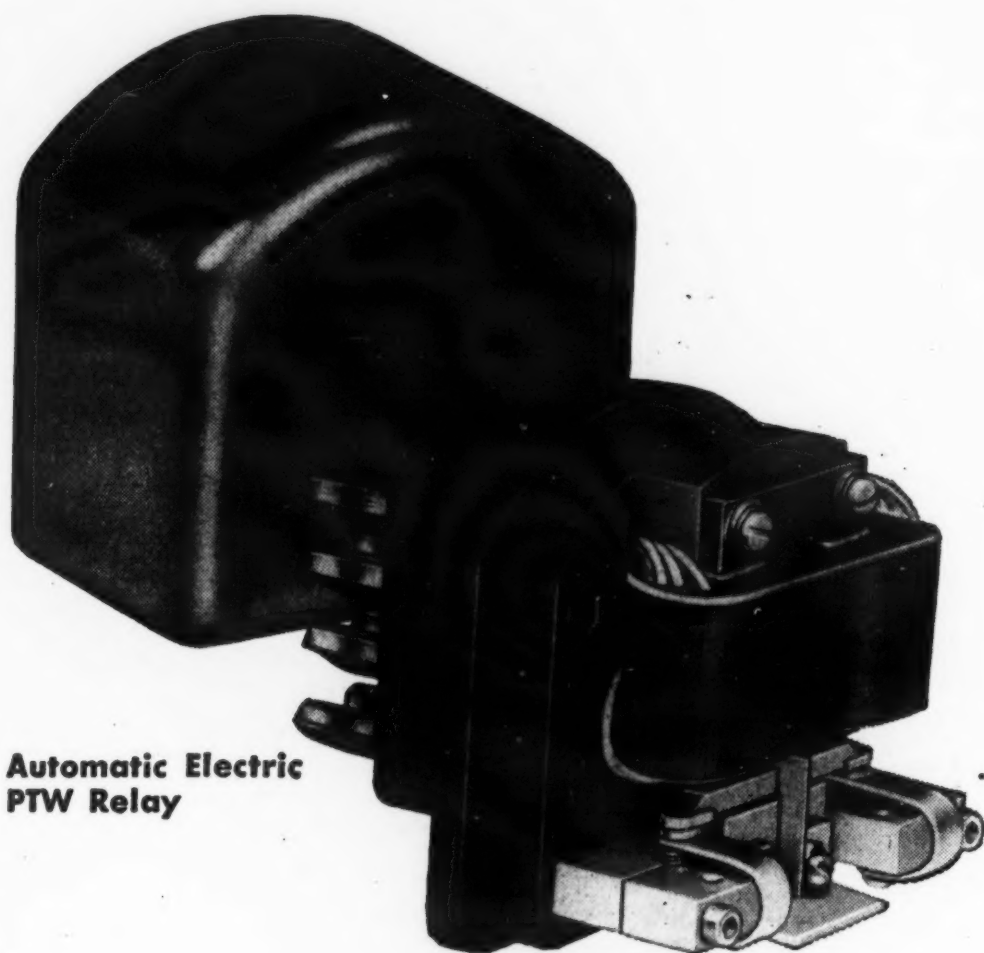
The turbulence inside internal-combustion engines as the fuel mist is drawn in has been photographed through a transparent cylinder wall with a lighting system that shows up vapors and currents of air of varying temperatures inside the cylinder. This approach also helps in ventilation studies, wind-tunnel design, and space heating problems.

In the study of rocket-engine firing behavior, the high-speed camera not only reveals otherwise invisible details, but permits removal of personnel and sensitive equipment from dangerous observation areas.

While much has already been accomplished, other fields, such as deep-sea underwater observation, have been only slightly explored. Recent developments suggest a wide variety of future applications in scientific and industrial areas.

New polar relay...

sensitive, rugged, compact!



Automatic Electric
PTW Relay

helpful technical data

Make and Break—75% total "make" on both contacts at 60 cycles per second with .006" contact gap and 23 milliamperes of sine wave ac. Simple, easy re-adjustment can be made in the field.

Windings—Four windings: two line-windings, each 139 ohms resistance and only .5 henry inductance; other two windings, each 101 ohms and .125 henry. The number of coil turns to be placed in series aiding can vary from 1400 to 8400.

Cover—Snap-on cover easily removed for inspection and adjustment of relay.

Mounting—Jack mountings, available for flush or surface mounting.

Size—2¼" wide, 2½" deep and 2½" high (plus ⅝" projection of banana plugs).

For more detailed information, ask for Circular 1821.

Here's a new polar relay that will soon be setting records for long service life! Its sensitivity gives peak performance for high-speed polarized pulse repeating, or for applications where low current is transmitted over long lines. The Series PTW Relay is also recommended for line-current direction indication or as a differential relay in the "Wheatstone Bridge" type of control. Advanced features include:

simplified design and long service life

New design eliminates many parts and adjustments formerly required. Relay gives *billions* of operations without re-adjustment.

extreme sensitivity

Unit operates on currents as low as 2 to 12 milliamperes, depending upon number and combination of windings used. Signals as low as 10 milliwatts through the two line-windings will "trigger" the relay.

reduced bounce and wear

A new method of armature support limits longitudinal movement. There are no bearings to wear . . . the usual rocking motion in contact make-and-break is reduced. Armature bounce is virtually eliminated; contacts last longer.

improved characteristics in smaller size

Because of increased magnetic efficiency, the coils take less space and need fewer turns. The lower coil impedance of this compact unit gives improved characteristics.

fast response

Travel time is as low as .9 milliseconds, depending upon contact gap and windings used.

send for circular

For a small, fast, sensitive polar relay that outperforms and outlasts all others, specify this new Automatic Electric Series PTW Relay. For details ask for Circular 1821. Write: Automatic Electric Sales Corporation, 1033 West Van Buren St., Chicago 7, Ill. In Canada: Automatic Electric (Canada) Ltd., Toronto. Offices in principal cities.

RELAYS

SWITCHES

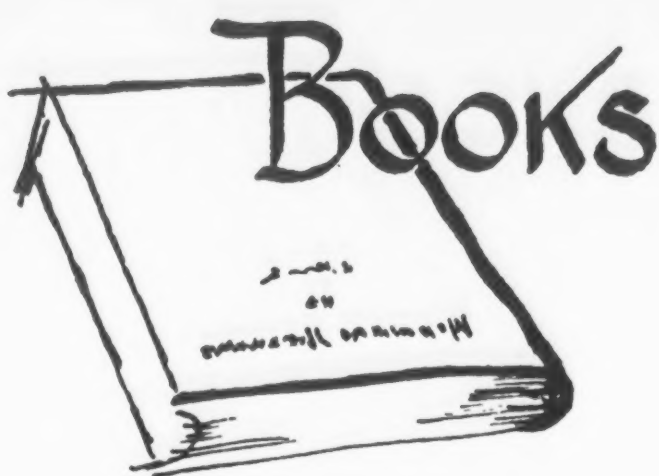
PRODUCTS OF THE INDUSTRIAL DEPARTMENT OF

AUTOMATIC



ELECTRIC

CHICAGO



FLASH! By Harold E. Edgerton and James R. Killian, Jr. Charles T. Branford Co., Boston, Mass. 215 pages, \$6.50.

In the new, revised edition of *Flash!*, Professors Edgerton and Killian of the Massachusetts Institute of Technology take the reader into a new and fascinating world of time and motion previously beyond the horizon of human vision.

Here are pictures of the swiftest action in the world of natural history, sports, science and industry, and everyday life, which before were lost entirely by the human eye or appeared only as a blur and now are frozen into crystal clear immobility.

Principle data about strobe photography is explained clearly and in non-technical language. In addition, the authors have included a section on supplementary data. This brings the reader up to the minute on all the latest developments in the use of electronic flash lighting, which forms the basis of stroboscope photography.

New scientific and industrial uses for stroboscope high-speed photography are constantly being found. For readers interested in its technical aspects, this revised edition offers a valuable supplement covering the principal facts about strobe and up-to-date information on electronic flash light theory, electronic flash producing equipment, a list of manufacturers of electronic flash equipment in the United States and abroad, and light meters for use with electronic flash.

THE SUPREME COMMAND. *United States Army in World War II; European Theater of Operations.* By Forrest C. Pogue. Office of the Chief of Military History, Department of the Army, Washington, D. C. 606 pages, \$6.50.

The Supreme Command tells the story of President Eisenhower's wartime exercise of command over the Allied Expeditionary Force as it seized a foot-hold in German-held Western Europe in 1944 and completed its mission of liberation by the following year.

SHAEF, which General Eisenhower used as his instrument of command, emerges from these pages as the great-

est Allied headquarters of the war.

The author has focused his account on Eisenhower and his staff, including those decisions of Roosevelt, Churchill, and the Combined Chiefs of Staff which affected the activities of the Supreme Commander. On the enemy side, he has included enough detail on Hitler and his commanders to provide a contrast between the Allied and enemy command organizations.

As a history of coalition warfare, this volume, published a decade after D-Day, has a significance that spreads far beyond this country's borders and grows more timely with each new headline.

PHOTOGRAPHY: THEORY AND PRACTICE. By L. P. Clerc. Edited by A. Krasna-Krausz. Pitman Publishing Corp., New York and London. 606 pages, \$15.00.

This is the 3rd English Edition of *La Technique Photographique* which originally appeared in 1926 and has become a classic in books on photography. It is internationally known and accepted as a general reference work on photographic science.

Seventeen scientists in various specialties and other writers combined to rewrite and revise the earlier English translation.

This volume has been a practical source book for photographers everywhere for nearly three decades and is likely to grow in popularity as the years go by. It is mainly concerned with principles and practices, modern working methods and apparatus, and generally avoids unnecessary details.

Some of the changes, additions and deletions noted in the present edition include material on processing and color, more precise terminology, footnotes in the main text, and elimination of marginal notes and dates.

While the book does not represent an attempt to compile an encyclopedia, it does give a complete treatise on today's methods and equipment.

Clerc's book is comprehensive in content, authoritative and well written, and should serve as an excellent reference book for anyone interested in or connected with photography in its various phases.

FRANK SMITH

Amateur Radio

(Continued from page 64)

hurricanes, the Iowa flood, and the California earthquake earlier this year.

Messages originated by local Red Cross officials were forwarded by radio to Red Cross amateur stations in Washington, Chicago and San Francisco; messages written by the Civil Defense Director at the Com-

TELEVISION HANDBOOKS

John F. Rider Publisher, Inc., New York, N. Y.

HIGHLIGHTS OF COLOR TELEVISION. By John R. Locke, Jr. 44 pages, \$.99.

INTRODUCTION TO COLOR TV. By Milton Kaufman and Harry E. Thomas. 140 pages, \$2.10.

TV FIELD SERVICE MANUAL. Edited by Harold Alsberg. 128 pages, \$2.10.

SERVICING TV VERTICAL AND HORIZONTAL OUTPUT SYSTEMS. By Harry E. Thomas. 176 pages, \$2.40.

TV TROUBLESHOOTING AND REPAIR GUIDE-BOOK. By Robert G. Middleton. 156 pages, \$3.30.

ATOMIC WEAPONS IN LAND COMBAT. *Second Edition.* By Col. G. C. Reinhardt and Lt. Col. W. R. Kitner. The Military Service Publishing Co., Harrisburg, Pa. 243 pages, \$3.95.

The first edition of this provocative book was acknowledged by military leaders, critics and military journals both at home and abroad as the first professional evaluation of the impact of atomic weapons on the battlefield.

The new, enlarged second edition has much new material and many changes to keep abreast of recent developments in fission and fusion weapons.

The authors show how the atomic weapon challenges military leaders because it is a tool that demands new and exacting skills.

Discussed for the first time are such important topics as the atomic weapon and airborne strategy, offensive and defensive tactics when both sides have atomic weapons, protective measures, medical aspects, the new aspects of the logistical problem, plus an appendix with a wealth of definitions, charts, and tables.

Our Book Department can furnish any book currently in print. We will also help to secure older copies that you may need to complete your library. A 10% discount allowed all Association members on orders of \$10 or more. Please indicate author and publisher where known and allow three weeks for delivery.

munity level were forwarded to the Director of Civil Defense for the state; and information from the Emergency Coordinators was flashed to ARRL Headquarters in West Hartford, Connecticut. Taking part in the relaying of these messages were members of the National Traffic System, comprising some of the best operators in the country.

ONE OF 674 REASONS WHY SPERRY EQUIPMENT SERVES YOU BETTER

In military aviation, as well as commercial aviation or any other field that depends on Sperry equipment — Sperry Field Engineers are working directly with customer personnel, training them in the proper use and care of our products to assure them of maximum utilization of the equipment.

■ Today, 674 Sperry Field Engineers are serving our customers—here and in more than 25 foreign countries. Whether you find our equipment in the sub-zero temperatures of the arctic, in the heat and dust of the desert or in the high humidity of the tropics, you will find Sperry Field Engineers checking product performance and providing guidance in maintenance.

■ These men are graduate engineers who have been specially selected and trained at one of the eight Sperry schools. Their training is constantly supplemented by informative reports and periodic refresher courses. Through them, the assistance of our laboratories and shops is brought directly to the customer.

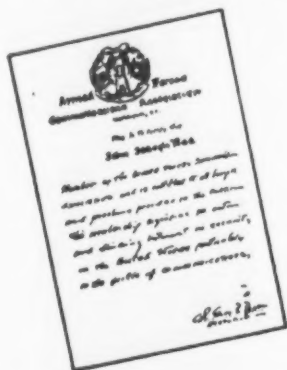
■ You receive more than quality instruments and controls when you specify Sperry equipment—you get the backing of the entire company through our world-wide service organization.

SPERRY *GYROSCOPE COMPANY*
DIVISION OF THE SPERRY CORPORATION
GREAT NECK, NEW YORK

Here a Sperry Field Engineer checks with an Air Force Observer on the operation of the Sperry K Bombing Navigation System.



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Membership Certificate
Ideal for Home or Office

\$1.50



AFCA Official Medal
(A.R. 600-70, para. 33e)

Bronze: \$3.00 Silver: \$4.00
Gold: \$5.00



Lapel Button
For Civilian Dress
Bronze: \$1.50 Sterling: \$2.50
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(Last Name) (First Name) (Middle Name or Initial)

ADDRESS: _____
Business: _____

Home: _____
Business Affiliation _____
or Employer: _____ Position _____

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Component: Army ☐ — Navy ☐ — Air Force ☐ — Marines ☐ — Civilian ☐
Coast Guard ☐ — National Guard ☐ — Merchant Marine ☐

Branch: _____ Rank or Grade: _____

Type of Membership desired:
Full—\$5.00 ☐ Student—\$2.50 ☐ Life—\$50.00 ☐ Foreign Associate—\$5.00 ☐

I am a citizen of the U.S.A. ☐ I am a citizen of _____ ☐

Enclosed find \$ _____ for annual dues for AFCA membership, which includes
subscription to the bi-monthly magazine SIGNAL.

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Ruggedness
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**Preferred Choice of Equipment Manufacturers,
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New Standard for Electrical Uniformity

The ML-2C39A sets the highest standard of electrical uniformity for UHF planar triodes.

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Quality in design, materials, and production techniques build superior reliability into the ML-2C39A.

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Electrical Characteristics of ML-2C39A*

Heater voltage, 6.3 volts

Grid-plate capacitance, 2.0 uuf

Amplification factor, 100

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Transconductance, 22,000 umhos

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*Manufactured to JAN specifications.

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